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Economies in Operation of Small Power Plants

Selection of Coal as to Quality and Size, Stopping of Air Leaks, also Cleanliness, Improve Plant Efficiency— Study of Plant Required—Extracts from Paper Before Iowa Section of N. E. L. A.

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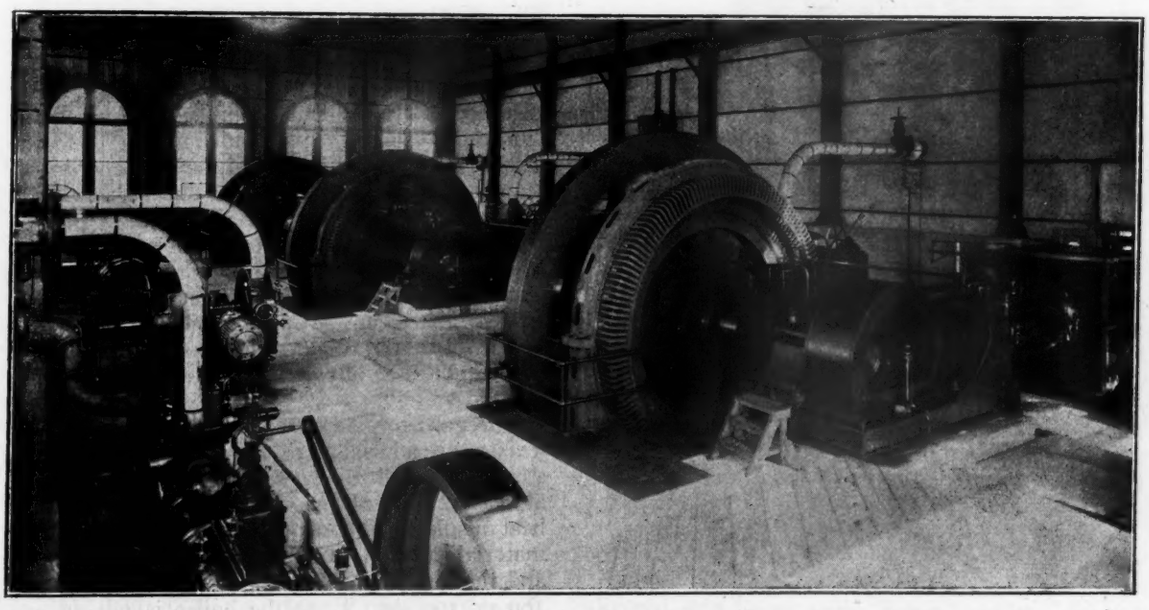
In the use of fuel, and the economies which are dependent upon the conservation of the heat units in the coal from the time it is fired until the heat is delivered from the switchboard as kilowatt hours, there is found a broad and general problem. The two divisions, of course, into which this question falls are those of the boiler room and those of the engine room. In the boiler room there are so many different things which may be discussed that an attempt to cover all of them would require the better part of 2 or 3 wks. and, consequently, I expect to describe only two or three things which have been carried out on the Illinois Traction power plants and which it is believed have produced remarkable results considering the conditions under which the operation has been made.

The first of these has to do with the kind of coal which it is possible for a power plant to utilize under the present freight conditions. I do not wish to go into this matter in detail, but I do wish to call attention to the fact that, with the very high freight rates which are now in existence, and with the peculiar differential arrangements which are existing in the freight tariffs, it is sometimes possible under the present operating conditions to buy a much better coal from a longer distance and secure a much lower over-all coal expense than was possible with lower freight and the larger differentials. This condition at first seems to be a peculiar one, but it can be readily checked over and I am convinced that it is worth a great deal of careful consideration. An example of this particular thing is found in one of the Illinois Traction power plants which is able to buy Franklin county coal delivered at the power plant for an amount so little per ton more than the cost of the coal in the immediate

Note.—Illustrations with this article furnished by Electrical Review.

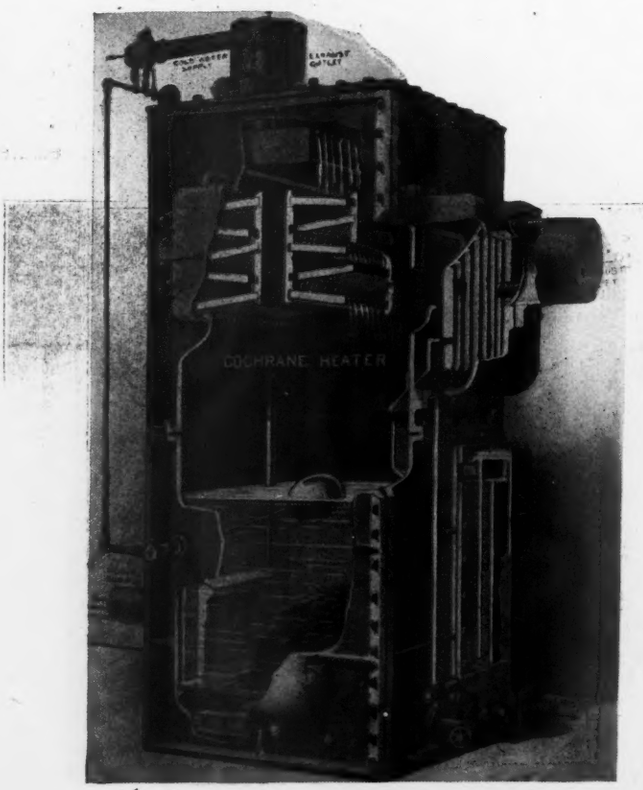


Engine Room in Which Pipes Are Covered and Equipment Is Maintained in a Clean and Efficient Condition.

district of the plant that the increased economy of operation of the power plant with the new coal makes the over-all cost of coal per kw-hr. considerably less than before. This is due entirely to the present freight rates and to the fact that the differential in freight rates is not at all similar to that which existed 3 or 4 yrs. ago when such a transaction would have been practically impossible.

The next important item which we have considered in the past year or two has been that of affording ample room for the combustion of fuel in the furnaces which have been built and which in a large number of cases have been rebuilt. We find that for Illinois coal and, in fact, for all bituminous coal of a reasonable ash and heat value, the most practical economical and efficient way of burning it is on chain-grate stokers with natural draft and with a very large combustion area in the furnace. We have changed a great number of our Stirling boilers from the old sprung arches to a flat arch, which we have been able to construct ourselves at a low cost. This, together with an enlargement of the combustion chamber obtained in most instances in the case of the old boilers by dropping the stoker as low as possible, has increased the efficiency of combustion in a number of our power plants to a remarkable degree.

We have secured maximum results by rebuilding our old stokers at a nominal cost and installing skids for the chains to operate over instead of rollers. This, together with the lengthening of the stoker in some instances, has brought about a very material saving in the operation of the furnace. The amount of coal which is dropped through the grate has been reduced in some cases as much as 75 to 80%, and this, of course, has a marked effect in the amount of coal fired. The fact that the stokers run smoothly over the skids has also, in some instances where high-carbon coal has been used, prevented the burning of the stoker links, which was a marked item with the use of rollers. We are now experimenting with a further method of introducing air at the rear of the furnace something after the plan which was used during the war for increasing the combustion in the boilers on the ships which were built under the direction of the U. S. Shipping Board. This has, so far, resulted in great success, and we are expecting to increase the efficiency of some of our boiler plants from 65 to 70% to as high as 75% under normal steady operating conditions.



Open Type of Heater Used to Raise Temperature of Boiler Feed Water.

Reduction of Air Leakage and Radiation Losses Increases Efficiency.

The combustion of fuel is also materially aided by careful attention to the settings of the boilers. A setting which admits air not under control, and which radiates a great quantity of heat will not produce a high efficiency in the boiler operation. We have found it economical to rebuild a setting which has become badly cracked long before it was ever rebuilt in the older days, and after this setting is rebuilt we have found it advisable to put from 1.5 to 2 ins. of asbestos or magnesia on the outside of the setting and cover this with canvas and then carefully paint it. We are holding the covering of this type to the boiler walls by the use of wire staples inserted between the bricks and spaced about 2 ft. apart when the setting is rebuilt. To these staples are attached "chicken wire" and over and under this chicken wire is plastered the asbestos cement or the insulator which is used for covering the setting. Over the whole of this is pasted a heavy canvas, and this is carefully painted with two or three coats of good waterproof paint. We have found that this saves a good deal of money and is well worth installation on any stoker-fired boiler, and I believe it would be advisable to carefully investigate it for hand-firing operation. So far we have not applied it to hand-fired boilers to any particular extent, but have relied primarily upon keeping the settings tight rather than reducing the radiation from such equipment.

It is not necessary to more than mention the keeping of the heating surfaces of a boiler thoroughly cleaned, both inside and out, or to emphasize the fact that it is desirable and highly economical to take the boiler out of service as often as it is necessary to make this a positive condition. Also, I do not believe it is necessary to more than mention the fact that holding the temperature of the feed water at 212 deg. F., or as near that point as it is possible to hold it, is worth all of the money which can be reasonably spent upon it in any well designed modern power plant.

In regard to pipe covering, we have found that it is very advisable to cover all high-pressure steam lines and to cover all feed-water lines with at least 2 ins. of magnesia or its equivalent in heat insulation. Uncovered feed lines permit a material drop in temperature between the heater and the boiler, and 212 deg. F. at the heater and 180 or 190 deg. F. at the boiler is not an economical condition in any boiler plant. The 212

deg. F. must be obtained as near the boiler inlet as possible.

Further economy which we have been able to secure at the power plant has resulted from requiring the proper sizing of the coal which is used for fuel. We find that 1.5-in. screenings on chain-grate stokers with natural draft produces as high economy as can be obtained on that type of equipment, and it has proven well worth while to carefully investigate the coal and to refuse coal which is not properly sized, especially in the larger plants. It is readily possible to spend for coal a great deal more than many of the savings in the power plant will amount to, by accepting over-sized screenings or by accepting screenings which are so full of dirt that a proper fire cannot be maintained. This is becoming a more and more recognized practice, and it is absolutely necessary in order to secure the highest efficiency in any power plant operating with chain grates or with any type of furnace which can economically burn bituminous coal.

There are many other economies in the boiler room which can be obtained by careful attention to the details of the operation, but the most important thing to bear in mind is that a boiler plant is no different from any other kind of machinery and that it is just as important to keep a boiler plant clean and to keep all of the working parts in high class condition as it is to keep the working mechanism of a sewing machine or a watch in a clean state. It is no more possible to obtain efficiency with a dirty boiler room and a dirty heater and uncovered feed lines than it is to tell the correct time with a dirty watch, and it is worth all the money required to bring this condition about and to keep it so by careful attention to details.

Particular Details Relating to Economies in the Engine Room.

In the engine room the economies which we have found the most important are primarily those affecting the condition of the prime movers. By this is meant an engine which has poor or broken rings, or which has a poor cylinder or bad valves which need either reboring or resetting, can cause a great loss; also a turbine which is improperly adjusted, so that there is more than a minimum of steam leakage over the ends of the blades or around the moving buckets, can produce a great deal of actual expense in the operation of the property. We have found it desirable when an engine is in such a condition to spend the money necessary to put it in first class condition and to keep it there. It does not take long to determine what the situation is in regard to any engine in a power plant, and if it is found that this engine is not tight and clean and in first class shape it should be immediately put in that shape, otherwise the economy obtainable from the plant is materially less than it should be. Of course, in condensing power plants there is a considerable amount of attention which should be paid to the operation of the condensing equipment. The most important thing in the operation of condensers we have found has been to keep the tubes clean and to keep them tight. We have had occasions where a coating of scale on condensers has reduced the vacuum from 28.5 ins. to 25 ins. before it has been possible to take the turbine out of operation for cleaning the condensers, and we have seen the vacuum immediately go back to 28.5 ins. after the equipment was cleaned. Of course, this has increased the water

Soot Blowers Reduce the Labor Required to Keep Boiler Tubes Clean.

rate of the turbine from 15 lbs. to approximately 20 or 25 lbs., depending upon the cumulative effect of the other conditions which existed at that time, such as the temperature of the incoming circulating water which perhaps fluctuated 10 deg. F.

Another important item in the operation of the engine room, especially where there are more than two or three units suitable for carrying the load, has resulted from a careful attention to the fluctuations of the load and to the carrying capacity of the machines. When the load-factor on the operating generators is held as high as possible by cutting out prime movers when the load falls and by putting them back into service again when the load rises, a large saving results. This has been in one of our power stations the cause of the difference between the use of 10 lbs. of coal per kw-hr. and approximately 15 lbs., under which condition the station has operated because of the inaccurate operation of two units when one might have carried the load if careful attention had been paid to its capacity and to the operation of the station. This has occurred in our operation in a plant carrying no more than 500 kw., so that it is easily applicable to the majority of the moderate sized operating plants.

In the engine room the same statement is true as that applicable to the boiler room; that is, that the operating machinery must be kept tight and clean and in first class condition if it is going to be possible to obtain the maximum economy from its operation. It is not possible to obtain good economy from a dirty engine, or a dirty turbine, or any machinery which is not kept clean and tight, and it is worth the money required to bring this condition about and to maintain the equipment in that condition. The operation of the property will be so much better, the service delivered will be so much better, and the general efficiency of the power plant as far as fuel is con-

cerned will be so much higher that we have found that there is no question but that the money required to maintain this condition is well worth spending. The operation of the boiler plant and of the engine room on the Illinois Traction System according to a policy of this kind has resulted in the year 1920 in a saving of a good many thousand dollars in the cost of coal alone due to the decrease in pounds of coal per kw-hr. from the amount used in the previous year, and it has cost but a small percentage of this saving to carry out the operation according to these outlines; with the additional result that the service given to the consumers has been also of the very highest type where years ago the operating conditions resulted in interruptions to service and a great number of complaints and in lack of confidence in the operating companies.

Advance Provision for Repair Work Reduces Emergency Costs.

The third place where economies may be obtained in the power house is in the purchase of material for maintenance. We have found that many things may be done by the organization in the power house, or by the people in the community in which the power house is located, to avoid paying exorbitant prices for new materials. At the present time condenser tubes may be welded, boiler tubes may be welded, and broken castings and broken parts of machinery may be put together again by some one of the welding or melting processes. This has resulted in some cases in enormous saving so far as the cost of maintenance is concerned. We have found that a large amount of iron work can be made up by the local blacksmith, or by the local machine shop.

We have found, also, that carrying an adequate stock of material which has been made up, and which is available for immediate use, has resulted in some instances in large economies on account of the cost of shipping emergency apparatus or working 24 hrs. a day to repair or to make new some operating parts of a prime mover. We are now carrying in stock coils for the generators on all of our prime movers and also all wearing parts of the larger turbines and engines. This in several instances has resulted in the saving of a good many hundred dollars in freight and express necessary to obtain a direct shipment of some piece of material which is badly needed in order to keep the service going. Such stock material should be carefully packed away and should be lettered or numbered so that immediate use can be made of it. This practice has resulted in a large amount of economy in our own plants.

Difficulty in Trying to Secure Efficient Operation in Dirty Plant.

It is impossible in a brief article to go into details concerning the economies mentioned above. I only wish to call attention to the fact that in every case the statements made are based upon actual experience with the 24 operating plants of the Illinois Traction System, and that we have found that careful attention to every piece of machinery in the plants and all of the necessary maintenance to keep it clean and thoroughly in first-class shape has been well worth all of the attention spent upon it. We have succeeded in making the operating efficiency of these power stations better than they have ever been before and have also succeeded in making them better each year than they have been previously for the last 5 or 6 yrs., so that there has been saved in the course of the last 12 mo. several hundred thousand dollars in the operation of these plants in coal over the operation of the corresponding plants in a 12-mo. period of approximately 5 or 6 yrs. ago. In other words, if the coal consumption per kw-hr. had been the same during the past 12 mo. as it was during a corresponding 12-mo. period of 5 or 6 yrs. ago the cost of coal during the past 12 mo. would have been a great deal more than it was.

It is unquestionably true that some things cannot be carried as far in some plants as they can in others, and is is also true that some economies which are applicable in one plant are not at all applicable in others, but this must be determined entirely by the man in charge of the plants in question. It is impossible for any man without either seeing or knowing about the conditions surrounding the operation of a plant to determine just what methods must be used to obtain the maximum economy, but if the principles which are outlined above are carefully carried out I believe it will be found that the maximum economy of the plant can be obtained with a very economical expenditure and a very surprising betterment can result if the plant is not performing as the operating organization may hope to see it perform.

CUSTOMER-OWNERSHIP LAUDED BY STATISTICAL EXPERT.

Benefits Result to Customers and Employes as Result of Purchase of Stock in Public Utility Properties.

The policy of public utility corporations in selling their securities to employes and customers is commended by Roger W. Babson, financial authority, who declares that companies furthering the plan of customer-ownership are helping to solve the questions of the distribution of property and the problem of corporate ownership and operation as opposed to political operation.

"Is not the true solution to have our street car system owned by the riders, our electrical companies owned by the users of the power, our telephone companies owned by the subscribers?" he asks. "The complaint against our public utilities comes from those who use them. When those who use them are the owners, there will be few complaints, partly for the reason that under such ownership the company will indulge in few injustices. Public utility companies have blazed a new trail. Their success with what is now called customer-ownership gives promise of a solution for other lines. I believe that we have here the beginning of a working plan for public co-operation with private management that may be applied equally well to railroads and possibly to some of the industries providing the necessaries of life. Approximately $100,000,000 has been provided certain of the utility companies within the last 2 or 3 yrs. through customers' subscription to the capital stock."

Correction of Power-Factor on Distribution Systems

Synchronous or Static Condensers Suitable for Correction of Station and System Power-Factor—Cost of Equipment and Voltage Regulation Determined by Method Adopted — Operating Data

By H. C. CROY

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Power-factor is a characteristic of electrical energy which is being transmitted by an impressed alternating voltage and resultant alternating current whereby it is possible for the current to rise and fall in magnitude with, before, or after the corresponding rise and fall of the electromotive force. Tied up with this relative timing of voltage and current waves is the "hope" and "grief" of the distribution game.

Development in the distribution of electrical energy has been practically dictated by developments in electrical energy producing and consuming apparatus. The first distribution system of any note was the d-c. 3-wire system, but the demand that distribution systems cover large areas necessarily forced higher distribution voltages. The difficulty in this situation was overcome by the advent of the transformer and the induction motor. As a result there is found today in the business section of large cities the d-c. distribution system, and in the outlying district covering a large area the a-c. distribution system is found. It is evident that power-factor, being a characteristic of a-c. distribution, is a phenomenon of widespread influence, and its influence is spreading at a tremendous rate.

The fact that current and voltage of given numerical values in an a-c. distribution system

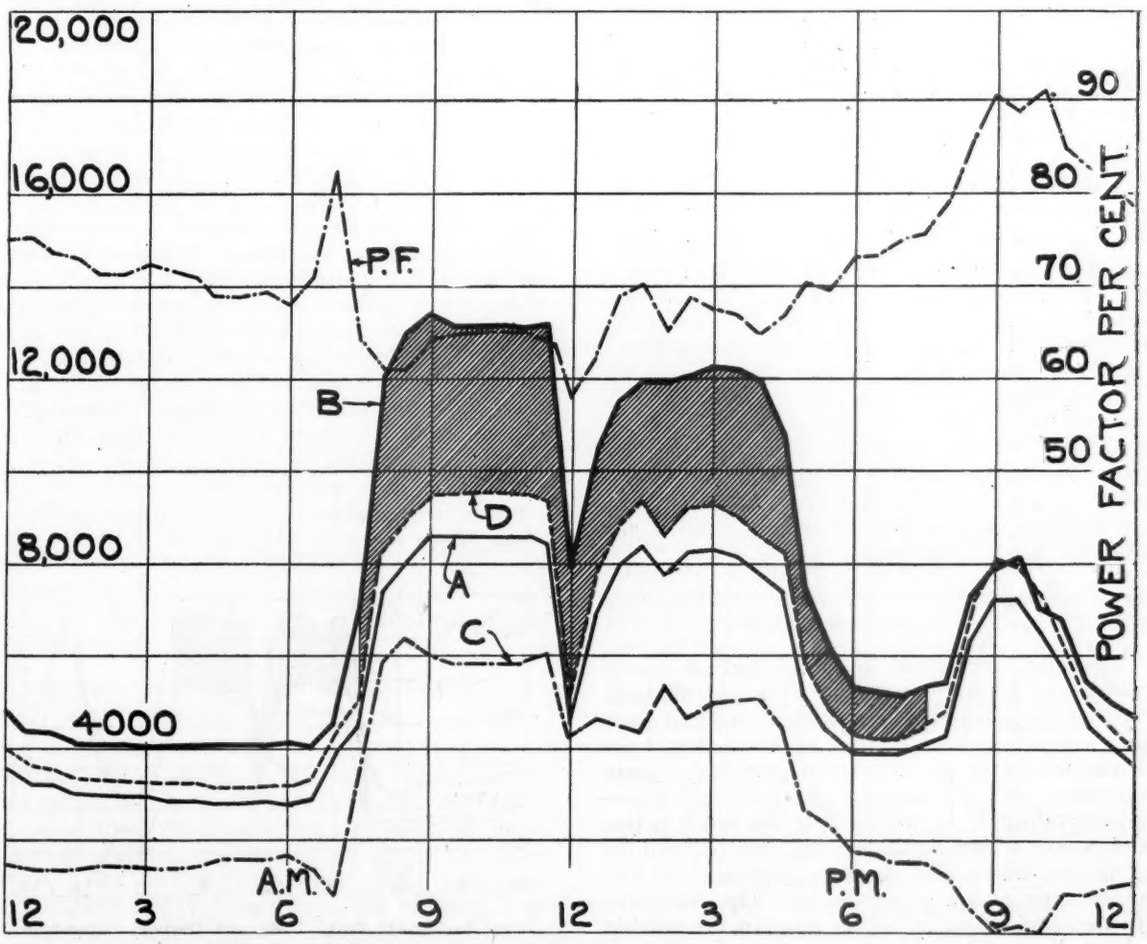


Fig. 1—Typical Daily Load Conditions and Derived Curves for West Division Substation.

Line *A* represents the substation load in Kw.; *B* represents the load in Kv-a.; *C* represents the condenser capacity required to correct the substation power-factor, represented by the line *P.F.*, to 90%, and *D* represents the Kv-a. load with an assumed power-factor of 90%.

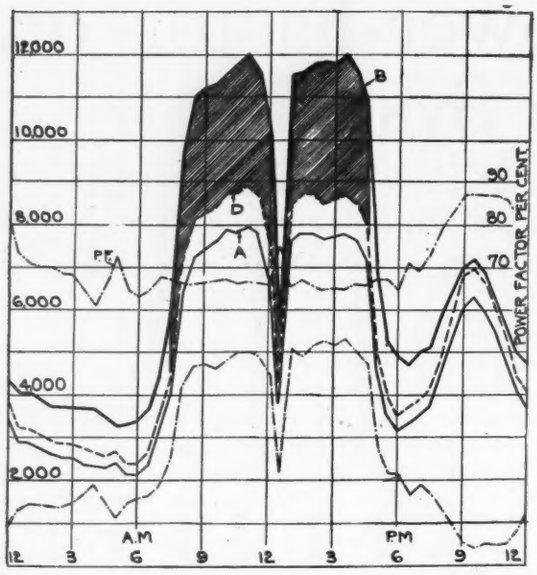


Fig. 2—Typical Daily Load and Derived Curves for West Madison Substation.

Line *A* represents the substation load in Kw.; *B* represents the load in Kv-a.; *C* represents the condenser capacity required to correct the substation power-factor, represented by the line *P.F.*, to 90%, and *D* represents the Kv-a. load with an assumed power-factor of 90%.

have the capacity of doing more or less work, according to whether they "pull" together or not, suggests at once the advisability of seeing what can be done to get maximum results. Probably the most prevalent source of the trouble is found associated with the use of the induction motor. The use of too large a motor, resulting from a miscarrying of good intentions, is a practice which has been one of the chief offenders. It would, no doubt, be found on investigation that a great number of small manufacturing plants are over-motored. By this is meant that in selecting the motor for any given load a generous allowance was made in the size of the motor. It is believed that this has been the general practice in the past, but now considerable engineering is being done to overcome this error. The seriousness of the result of such a practice will be appreciated when it is remembered that the lagging magnetizing kv-a. on a general line of 60-cycle induction motors runs from 30 to 60% of the full load, and holds constant in a given motor over the whole load range.

Power-Factor Decreases With Decrease in Load on Induction Motors.

Consider, for example, an induction motor which has a power-factor of 85% at full load, 75% at three-quarters load, 60% at one-half load, and somewhere around 35% at one-quarter load. Inasmuch as the per cent of magnetizing current increases with the decrease of speed and horsepower rating, it is evident that the small induction motor which forms the majority of the total connected motor load of an a-c. system is the primary cause of low power-factor. The line transformer also comes in for its share of the trouble, although in a lesser degree.

Since it is a fact that the load on a power system varies with the hours of the day, and since in the past the maximum current demand for the day has nearly always come with the evening lighting peak, which has a good power-factor, not much attention was given to the low power-factor of the industrial day load. This industrial load has filled the "valleys" in the load curves, but on account of its low power-factor has begun to demand the expenditure of money for distribution capacity beyond that which is demanded by the evening peak. This is the situation in which the Commonwealth Edison Co. is placed, and it is a serious problem as to where the economical point of application of correction of power-factor lies—whether the company should assume the burden of the expense and install synchronous condensers in the substations, install static condensers at the feeder centers, or ask the customers causing the trouble to equip their installation with static condensers or pay a penalty for the existing condition.

Conditions Resulting From Installation of Synchronous Condensers.

We will consider the first proposition. A selection has been made of typical load curves of West Madison, West Division, Troy, and Kolmar substations, showing the effect of bad power-factor. Fig. 1 shows a typical load curve for West Division substation. It may be noted that between the hours of 7:30 a. m. and 4:30 p. m. the average power-factor is about 70%. The load maximum of approximately 8500 kw. occurs at 10 a. m. with a corresponding volt-ampere load of 13,000 kv-a. This condition is due entirely to the low power-factor (70%). We will assume a base of 90% power-factor on all future cases.

Curve *C* in Fig. 1 shows that 6000 kv-a. of condenser capacity is required to bring the power-factor to 90%, while curve *D* shows the corrected kv-a. for the kw. curve *A*. The shaded portion shows the amount of "wattless" energy carried by the transmission lines for which it is necessary to operate our uneconomical units. In addition to the low operating efficiency the line loss and copper losses of the substation transformer are increased. The average daily line loss, without condensers, at West Division substation from 8 a. m. to 8 p. m. is 4320 kw-hrs.

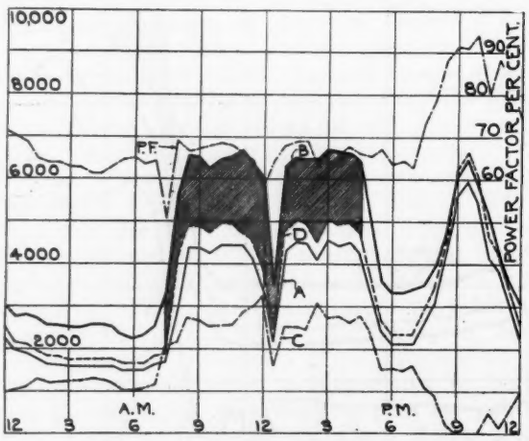


Fig. 3—Typical Daily Load and Derived Curves for Kolmar Substation.

Line *A* represents the substation load in Kw.; *B* represents the load in Kv-a.; *C* represents the condenser capacity required to correct the substation power-factor, represented by the line *P.F.*, to 90%, and *D* represents the Kv-a. load with an assumed power-factor of 90%.

With condensers correcting the power-factor to 90% the loss would be reduced to 2355 kw-hrs. Assuming the cost of generation to be $0.0085 per kw-hr. this represents a yearly saving of $4676.70, which, capitalized at 7%, would cover an investment of $66,810. The cost of a 6000-kv-a. synchronous condenser, which would be required to make this saving, at $8.50 per kv-a. installed would be $51,000. In addition about 3000 kv-a. of generating, transmission and substation capacity would be released, which is worth about $186,000, distributed as follows: Generating station equipment at $30 per kv-a.—$90,000; transmission system at $18 per kv-a.—$54,000; and substation equipment to the 4000-volt bus at $14 per kv-a.—$42,000, making a total of $186,000.

Installation of synchronous condensers in the substation in conjunction with power-limiting reactors in the transmission lines gives the substation operator direct control over the primary voltage, independently, within certain limits of the generator-bus voltage. Automatic control may be installed to maintain either constant power-factor or constant voltage. By relieving the generators of a large volume of "reactive power" their operation is rendered more stable and reliable. Modern generating units are not designed to operate as condensers, and when used as such are very unstable in cases of system trouble.

TABLE SHOWING INVESTMENT SAVING THAT WOULD RESULT FROM USE OF CONDENSERS.

Transformer capacity in substation, Kv-a.	12,000
Power-factor at maximum Kv-a. load	64.1%
Condenser capacity required to correct power-factor to 90%, Kv-a.	7,650
Station capacity at 12,000 Kv-a. and power-factor of 64.1%, Kw.	7,692
Station capacity at 12,000 Kv-a. and power-factor of 90%, Kw.	10,800
Load capacity made available by increasing power-factor from 64.1% to 90% expressed in Kv-a. at power-factor of 64.1%	4,850
Synchronous condensers:	
Value of capacity released (4850 x $62.00)	$301,000
Cost of synchronous condensers (8000 x $8.50)	$68,000
Saving	$233,000
Static condensers at feeder centers:	
Value of capacity released (4850 x $81.32)	$395,000
Cost of static condensers (7650 x $30.00)	$229,500
Saving	$165,500
Static condensers on customers' premises:	
Value of capacity released (4850 x $87.32)	$423,000
Cost of static condensers (7650 x $25.00)	$191,000
Saving	$232,000
Unit costs assumed per Kv-a.:	
Generating equipment	$30.00
Transmission system	18.00
Substation equipment to 4000-volt bus	14.00
Substation circuit	6.00
Circuit cable	13.32
Distribution transformers	6.00
Synchronous condensers	8.50
Static condensers at feeder centers	30.00
Static condensers on customers' premises	25.00

Small Units Employed in Case Static Condensers Are Adopted.

Static condensers might be installed at the feeder centers to give the same power-factor correction. The condenser capacity would be divided into small units in the case of West Division substation—19 units of about 300 kv-a. each. The cost of a 2300-volt static condenser is assumed as $17.50 per kv-a. not installed, and the present designs require a weatherproof housing of some kind. The floor space required for a 300-kv-a. condenser is 3 ft. 4 ins. by 4 ft. 8 ins., and the height is 7 ft. 4 ins. This housing would be too large to mount on a pole, so space would have to be rented or constructed. The cost of the complete installation would average $30 per kv-a.

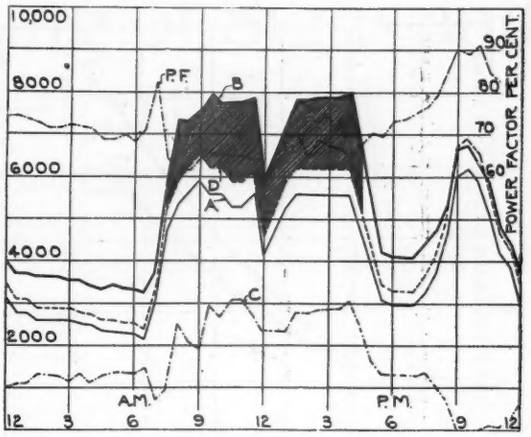


Fig. 4—Typical Daily Load and Derived Curves for Troy Substation.

Line *A* represents the substation load in Kw.; *B* represents the load in Kv-a.; *C* represents the condenser capacity required to correct the substation power-factor, represented by the line *P.F.*, to 90%, and *D* represents the Kv-a. load with an assumed power-factor of 90%.

The difference in cost between the synchronous and static condenser of $21.50 per kv-a. is partly offset by the saving in circuit cable. The comparative cost of supplying load under the three schemes is shown graphically on Fig. 5. Static condensers at the feeder center are not under control of the operator and cannot be used for purposes of voltage regulation. During the night when the power load is all "off" the power-factor will be "leading" on most of the circuits, and the "leading" current flowing through the reactance of the line and regulators will cause the circuit voltage to rise above the voltage at the regulator terminals. This will tend to give poor voltage regulation during the night when the load is chiefly lighting.

Static condensers could be installed on the customers' premises for about $25 per kv-a., allowing $5.50 for autotransformers and $2 for installation. Distribution transformer capacity at $6 per kv-a. would be saved in addition to the circuit cable. Curve 3 on Fig. 5 shows that below about 60% power-factor static condensers on the customers' premises are more economical, but above 60% synchronous condensers in the substation are more economical. When the customer takes his motor load off the condenser can also be cut off, thus leaving the circuit regulation for lighting the same as at present. In this respect this plan results in better operating characteristics than the plan for static condensers at the feeder centers, but still does not give the same flexibility as would the use of synchronous condensers.

An accompanying table shows the capacity which could be made available at West Division substation by installing an 8000-kv-a. condenser to enable the station equipment to carry full load at 90% power-factor. The saving is shown for each class of installation. It will be noticed that synchronous condensers in the substation, and static condensers at the customers' premises, are about on a par. The synchronous condenser is therefore preferable because of the facilities it

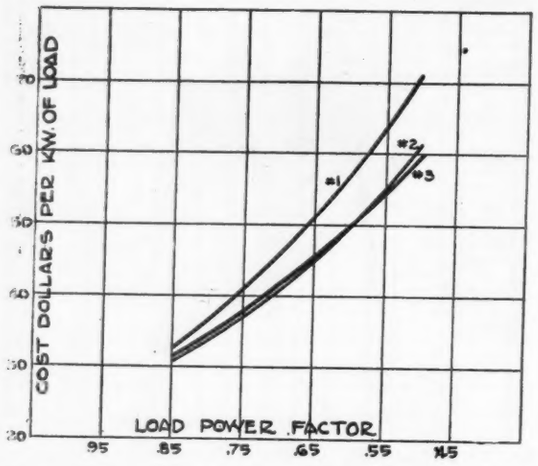


Fig. 5—Curves Showing Comparative Costs per Kw. of Supplying Load.

Line No. 1 represents costs when static condensers are installed at feeder centers. Line No. 2 represents costs when synchronous condensers are used in the substation. Line No. 3 represents costs when static condensers are installed on customers' premises.

Unit costs of equipment are given in the accompanying table. The power-factor is corrected to 90%. The cost of overhead construction is not included.

gives for voltage control and stabilizing the system.

By comparing the shaded parts of the curves of Figs. 2, 3, and 4 for the other substations with Fig. 1 it will be seen that a considerable saving could be accomplished by the correction of power-factor.

AMERICAN CAPITAL IN JAPANESE COMMERCIAL ALLIANCE.

Those who take more than passing note of American business activities in the Far East will be attracted by the interesting commercial alliance which recently occurred in Japan. The Nippon Electric Co., an allied company of the International Western Electric Co. of New York, and said to be the oldest concern with participating foreign capital in the Mikado's realms, has joined forces with the Sumitomo Electric Wire & Cable Works, of Osaka, one of the oldest commercial enterprises in Japan. A new company has been organized to be known as the Sumitomo Electric Wire & Cable Works, Ltd., for the production of power, telephone and telegraph cable. It has started with a capital of 10,000,000 yen, or about $5,000,000. Under the provisions of the alliance, the Nippon Electric Co. has granted to its new associate the right to use all its manufacturing and engineering information and patents which it receives from Western Electric Co., covering the production of cable. The Sumitomo company, which is primarily a manufacturing concern, on its side has agreed to assist the Nippon company in the sale not only of electric wire and cable but also all its other products.

In the association of the Sumitomo and Nippon Electric companies there is an element of historic interest. The House of Sumitomo is one of the oldest banking and commercial organizations in the Empire. Its activities were first recorded in 1690, when, with the discovery of the Besshi copper mine, the family became engaged in mining. In 1868, after the restoration of the power of the Emperor, the Sumitomo interests began to broaden, and there were founded in quick succession the Sumitomo Copper Sales Co.; the Sumitomo Warehouse Co. with branches at Tokyo, Osaka and Kobe; the Sumitomo Bank, Ltd.; the Sumitomo Steel Works; the Sumitomo Fertilizer Manufacturing Co., and the Electric Wire & Cable Works. The Nippon Electric Co. dates back to 1895 when the Western Electric Co. founded an agency in Japan. At that time the laws of the island empire prohibited the introduction of foreign capital into Japan for participation in any commercial enterprise. This ban was lifted in 1899 and the modest agency of the great American electrical concern was broadened into the Nippon company, with a capital of 200,000 yen. Its present authorized capital is 10,000,000 yen. Baron K. Sumitomo, the managing genius of most of the new enterprises which bear his name and one of the heads of the new company, is a great admirer of American methods. He has made several personal and extensive investigations of industries and mines in this country and Europe. In 1911 he was created a baron as a reward for the noteworthy services he had rendered to industrial Japan. He will have as his associate in the new enterprise, K. Iwadare, managing director of the Nippon Electric Co.

CIVIL SERVICE EXAMINATION FOR ELECTRICAL ENGINEER.

The U. S. Civil Service Commission has announced an open competitive examination for associate electrical engineer, applications for which will close Nov. 15. Vacancies in the Bureau of Mines, Department of the Interior, for duty at Pittsburgh, at $3000 to $4000 a year, and in positions requiring similar qualifications throughout the United States, at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

The duties of this position require that the appointee be thoroughly conversant with the requirements and actual use of electrical equipment in mines and competent to conduct and supervise investigations both in the field and laboratory, and to initiate and conduct laboratory tests of all classes of electrical equipment used in mines for the purpose of increasing the safety and efficiency of mining operations, capable of designing and constructing laboratory apparatus and testing devices, and able to prepare reports of field and laboratory investigations. Applicants should apply to the Commission at Washington, D. C., asking for form 2118 and stating the title of the examination desired.

EDISON PLANT INCREASES WORKING FORCES.

The Thomas A. Edison industries, West Orange, N. J., are increasing the working forces at their plant, and all departments are again in operation. Recent additions have brought the working quota up about 60%, as compared with the number of employes a few months ago, and about 3200 operatives are now engaged at the plant. Under peak production, the plant has given employment to as many as 7500 workers.

Problems in Lighting of Signs and Billboards—Part II.*

Size and Shape of Letters and Spacing, and Characteristics of Lamps Determine Appearance—Different Treatments for Large and Small Displays—Many Types of Equipment Now Standard

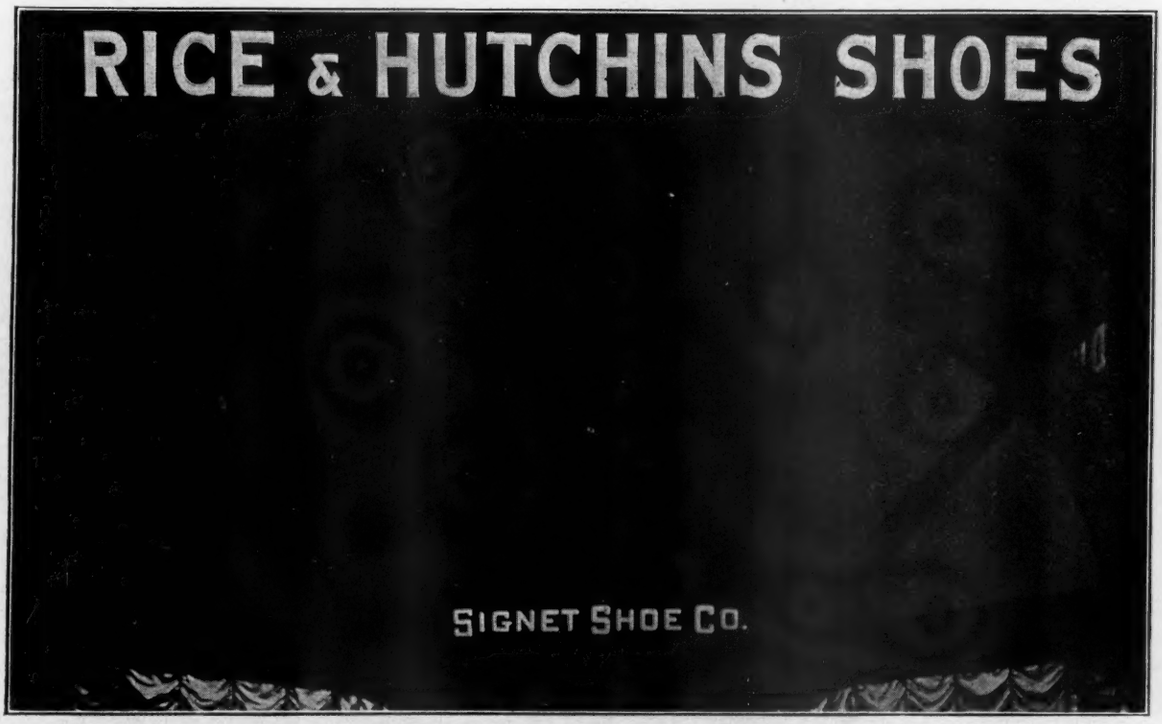
By J. M. SHUTE
Edison Lamp Works, Harrison, N. J.

A touch of color gives charm and interest; an overload of color looks crude and undignified except in very rich and spectacular displays. The most desirable colors for sign work are opal and yellow on account of their low absorption. Ruby or red is also much used and is distinguishable at great distances. Green, blue and purple are not efficient for many practical purposes and are not to be generally recommended. Lamps of warm, contrasting colors give pleasing effects. In general, a solid mass or continuous line of color is more attractive than a mixture of colors, as the introduction of different colors breaks the continuity of outline and thus detracts from the effect.

Color caps or color shades are a substitute for natural colored glass lamps or dipped lamps. The advantage over the former is that they are less expensive in the long run, and over the latter that they will stand the weather while the color on a dipped lamp will generally wash off when exposed to rain. They also have the advantage of being readily changed, and a man can have a red effect on his sign one week and blue the next week if he so desires at a comparatively little extra cost.

With either large or small signs of this type the aid of a flasher is desirable. A large and very brilliant sign will often attract attention much more quickly if it is flashed on and off, either wholly or in part, accordingly to the form of the advertisement, than if it remains lighted at all times. In the case of smaller signs attention is attracted much more quickly when colored border lamps are flashed on and off, giving momentary lighting effects which represent fountains, serpents, rolling wheels or various other attractive designs that fit the advertisements shown. Then, also, the motor flasher is a money saver, since for the same sign from 30 to 50% in power consumption may be saved by flashing rather than by leaving it continuously illuminated. Whether a sign should be continuous or flashing, whether the bulbs used should be clear, frosted or colored, whether different colors should be flashed on and off, whether different colors should present the

*This article is a continuation and conclusion of the article by Mr. Shute, appearing on p. 535 of ELEC-Review of Oct. 8, 1921.



Store Front Sign of Opal Letters Illuminated With 75-Watt Daylight Lamps.

same or different messages, and whether the flashing sign should depict some motion or mechanical operation, are all matters which must be studied with reference to the subject and to the impression that will be made on the observer.

Various forms of signs lighted from the interior present a good appearance, and this makes possible at a small cost an advertising medium which will yield good returns. Most of these signs employ relatively large lamps placed within a housing. One form is known as the "bull's-eye" sign and has a quite wide general use. It consists of a box of metal that is water tight and dust proof, and meniscus lenses are set in holes punched in the face of the sign. The light from the concealed lamps is transmitted through the lenses which therefore take the place of bare lamps in the first type of sign and present a somewhat similar appearance. The daylight effect of such a sign is usually good, but at night unless careful design is carried out spotted effects are quite likely to prevail due to the unequal lighting of the various lenses. One means of overcoming this effect is to utilize a number of small reflectors inside of the housing to direct the light uniformly on the various lenses.

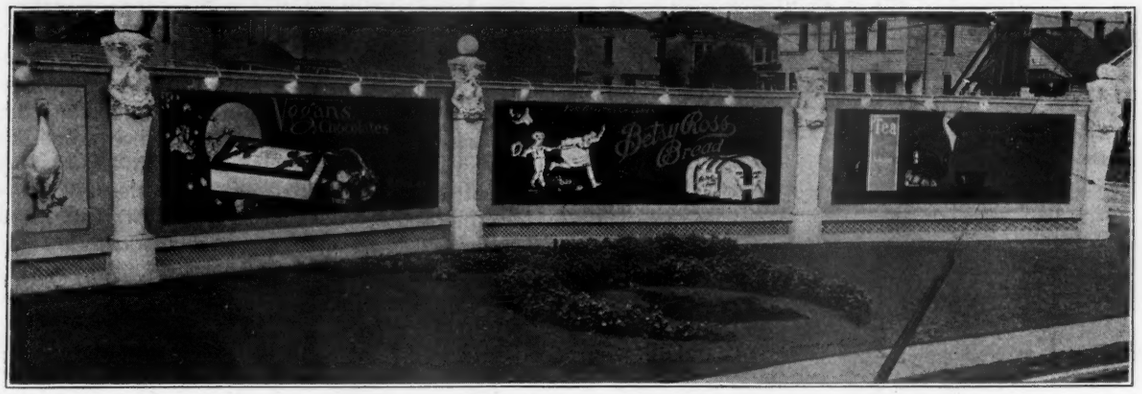
Sign Illuminated With 80 Blue Mazda Lamps of 25-Watt Rating.

Another form of sign is known as a "cut-out." Here the outline of the letter is punched through the outer face and letters are set inside with a small space between the letter itself and the face of the sign. Light from lamps inside of the casing strikes the white face of the letter, causing it to be uniformly illuminated. On account of the open spaces the sign is neither dust nor rain proof, and with darkened surfaces the reflecting power is soon diminished. If lamps are so placed that rain drops may strike them, water cracks are likely to be caused, resulting in early burnouts. Difficulty may also be experienced with the wiring unless it is so protected as to eliminate the possibility of damage by water.

Another widely used and justly popular inexpensive sign is known as a "glass panel" transparent sign. In this a light-density glass plate is fastened tightly against the face of the sign from which letters have been cut. Light from large lamps inside of the casing is transmitted through the glass, and the letters show up in contrast with the black background. This form of sign can be made dust and water proof and hence be operated economically. Its appearance can be greatly improved by using colored glass plates to emphasize the message. As with any sign of this general nature the distribution of light over the face should be even. A frequent finishing of the interior of the sign with a flat white paint is therefore a decided asset as the white surface by diffuse reflection gives a uniform intensity throughout.

Billboards and Large Painted Signs Require Light for Night Illumination.

A modification of this general type of sign is made by punching the face of the metal in the form of a stencil. Letters of opal glass are then fastened to the inside of the face. These are curved so that they project an appreciable distance out from the metal, enabling one to read the sign at a greater angle than if flat letters were used. An example of this type of sign is shown in an accompanying illustration. In practically all signs of this type the light is in some way diffused and hence little of the brilliancy and glitter found in signs with visible lamps is present. If such signs are used in the presence of more brilliant effects they will often appear to be rather dull, due to the predominant yellowish light of the clear-bulb lamp. The use of daylight lamps proves valuable here, overcoming the dull appearance and making the letters stand out and appear much more brilliant. The 75, 100, 150 and 200-watt type C or daylight lamps are useful in such signs as those under discussion, the proper size of lamp depending on the dimensions of the sign and its location. Although the smaller sizes are less efficient it is frequently desirable to employ a number of these than a few large lamps on account of the greater uniformity of illumination thus secured.



Illuminated Billboard of a Type that Adds to the Appearance of the Community Where Installed.

The methods of lighting billboards and large painted signs are of an entirely different character than those already described. In this case the illumination is furnished by units placed in front of the board in such a manner as to direct the light on the message which we see by reflected rather than by direct or transmitted light. In order that the sign may be bright enough to attract attention and stand out prominently the units must be fairly large to produce a high intensity. The light sources must be concealed from the eye so that glare will be eliminated, for in this case the board with its advertising message is the object to be seen, not several high-intensity brilliant light sources.

Reflected Glare Eliminated by Proper Placing of Light Sources.

Reflected glare should also be eliminated by placing the light source in the proper position. It would be better if signs which are viewed from below had the units mounted at the base to throw their light upward on the board, as the angle of incidence would be such that the reflected light would be upward and therefore not in the direction of the observer. With signs viewed from above the position of the light source should be reversed; that is, placed at the upper edge so that the reflected glare will be thrown below the observer. This practice, however, introduced some structural and maintenance difficulties, so for most situations light sources placed well above the board meet the operating conditions. However, the higher the units are mounted above the board the more concentrated the distribution will have to be in order to utilize the light effectively. At the present state of the art there is no standard low-cost unit for outdoor use which gives exactly the desirable distribution, so a compromise must be effected.

The general practice is to mount lamps and reflectors at the lowest point where they will not interfere with the view of the board and ignore the effects of reflected glare, since the sign is usually viewed from a considerable distance. In cases where the glare effect is severe it can be largely eliminated by employing dull rather than glossy finish paint.

Porcelain enameled reflectors have been found to be low in cost and stand up well under severe weather conditions. The enamel finish does not deteriorate or accumulate an excessive amount of foreign material, and the dirt which does gather on the reflecting surface can be readily removed by washing. These reflectors are small, compact and of light weight, thus allowing them to be suspended far enough in front of the board to give a uniform distribution of light without causing excessive strain on the mechanical support or casting large shadows on the face of the board during daytime. Type C lamps of the various sizes are ordinarily employed with angle type reflectors. If these are properly placed and spaced with reference to the board very little of the light will be lost. The distribution of the angle reflector is such that the maximum light is directed toward the bottom of the board, tending toward uniform illumination.

Uniform Light a Requisite Over the Entire Sign.

It is evident that the illuminated sign can never be as brilliant as those with visible lamps, yet it should be lighted to a sufficiently high intensity for it to stand out from its surroundings. It should be attractively designed in order to meet the more severe competition of its glittering and brilliant neighbors. Uniform illumination is naturally a factor in attractive appearance. Individual porcelain enameled angle reflectors have been found by test to be of a higher efficiency and more durable than the cheaply constructed

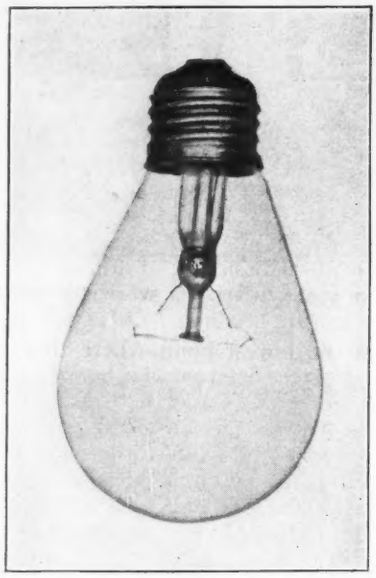
TABULATION OF TECHNICAL DATA RELATIVE TO STANDARD MAZDA SIGN LAMPS.

Watts.	Type.	Voltage.	Average hours life.	Bulb.	Diam., ins.	Maximum overall, ins.	Standard package.
5	Cl. Mazda B	11 to 12½	1500	S-14	1.750	4.25	100
5	Cl. Mazda B	55 to 65	1500	S-14	1.750	4.25	100
10	Cl. Mazda B	110, 115 & 120	1500	S-14	1.750	4.25	200
25	Blue Mazda B	110, 115 & 120	1000	P-19	2.375	4.25	125
50	Blue Mazda B	110, 115 & 120	1000	P-19	2.375	4.25	125
50	White Mazda C	110, 115 & 120	1000	PS-20	2.500	5.12	100
75	Cl. Mazda C	110, 115 & 120	1000	PS-21	2.750	6.12	64
75	Mazda Daylight	110, 115 & 120	700	PS-22	2.750	6.12	64
100	Cl. Mazda C	110, 115 & 120	1000	PS-25	3.125	7.12	24
100	Mazda Daylight	110, 115 & 120	700	PS-25	3.125	7.12	24

For billboard lighting the standard type C lamp from 75 to 1000 watts—110-115 or 120 volts—and from 100 to 1000 watts—220, 230, 240, or 250 volts—are used as discussed in detail on the section applying to the subject.

reflectors often employed, and it is not good practice to sacrifice efficiency and durability for a low first cost.

In designing the lighting equipment for any



Sign Lamp With Filament Arranged in Ring to Produce Brilliant Appearance.

billboard the desirable intensity, of course, depends upon the general illumination of the locality and the character of surrounding signs. The data given in an accompanying table applies to billboard lighting under usual conditions; that is, for boards situated in well lighted districts. Where the surrounding intensities are particularly high, larger units than those specified should, of course, be employed in order that the board will be at least as brilliant as its surroundings.

Although boards of the dimensions given in the table are found in practice, the ones most often

TABLE SHOWING SPECIFICATIONS FOR BILLBOARD ILLUMINATION.

Height of board in ft.	Mounting dimensions of lighting units. Spacing in ft.	Distance out in ft.	Distance above in ft.	Size of lamp in watts.	Average foot-candle.
3 to 5.....	5	4	1	75	9
6 to 8.....	6	5	1	100	9
9 to 12.....	6½	7	1	200	10
13 to 17.....	9	8	1.5	300	11
18 to 21.....	12	11	2	500	10
22 to 25.....	16	15	2	750	11
25	20	18	2	1000	10

employed are those from 9 to 12 ft. in height. From the table it is seen that 200-watt type C lamps equipped with the proper size of porcelain-enamel steel angle reflectors are recommended for use with boards of this size. With units mounted as recommended on these boards an intensity of about 900 cp. is projected at an angle of approximately 35 deg. from the vertical, striking the board about 1 ft. from the bottom. From this point up the intensity gradually decreases to about 400 cp. in the horizontal direction, or in line with the top of the board. Taking into consideration the distance between the light source and any point on the board, and also the angle at which the light strikes the board at that point, the intensity of illumination from the top to the bottom of the board will be approximately uniform.

The tendency is to mount units too close to the board, causing poor illumination. The advantage gained in mounting the units far out from the sign offsets the cost since the distance from the unit to the top of the board and from the unit to the bottom of the board are more nearly equalized, thus the light is more evenly distributed and the highest intensity is directed toward the bottom of the board without the necessity of tilting the reflector at such an angle that the top of the board is in shadow.

In installing lighting equipment for a billboard accessibility of the units should always be given consideratoin. The units should be so mounted that they can be reached regardless of the weather conditions, as by this means much time and labor can be saved. The mounting should be of such a character that the supports will withstand any wind pressure that tends to displace them from their proper positions.

Flood Lighting Employed With Billboards Under Some Conditions.

Billboards and painted signs located in inaccessible places or at considerable distances from the power supply are usually illuminated by flood-lighting projectors. These employ concentrated-filament lamps in properly designed reflectors of the parabolic type, and direct a concentrated or spread beam as occasion demands on the sign. An interesting and effective innovation in billboard lighting is the application of color effects. Colored objects present different appearances when illuminated by various colors of light. Red light falling on a blue object makes it appear black; green light falling on a yellow object makes it appear green. A red object on a white background, if illuminated by red light, appears practically invisible, for both the object and the background are equally luminous. Similarly, green light would cause a green object to blend with the background and be invisible. It can be readily seen that by proper painting of the sign and the application of suitably tinted light complete changes are possible as the light is changed by means of a flasher. The same board may thus present two or more messages in a novel manner. An appreciation of color effects can be obtained with a little experimentation and these principles utilized in planning billboard lighting.

The billboard is generally looked upon as an eye-sore in a community, and many times this view is justified. The more progressive concerns are realizing that it is necessary to overcome public opinion and are installing well designed and substantially constructed artistic boards. Many of these even have small garden plots in front and are surmounted by ornamental decoration. By the use of artistically designed posters or well painted signs such billboards become in reality an asset rather than a liability to the community. They serve to hide many an unsightly vacant lot, and the better class are really attractive. Artificial illumination of these boards is particularly important in order that they yield the maximum return on the relatively high investment.

The design of the wiring for electric signs of any kind is important. Wiring of insufficient

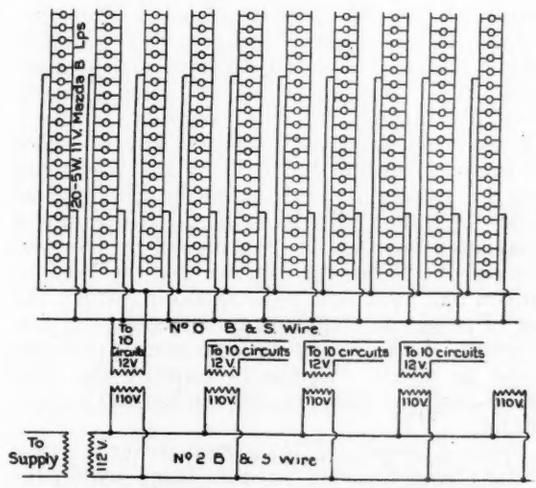
capacity to carry the connected load causes the lamps to burn under voltage. Incandescent lamps should always be burned at their rated voltage—if the actual voltage is lower than the rated voltage the brilliancy of the lamps will be materially decreased. Care should always be taken that lamps of the voltage actually obtained at the sockets are used, as nothing spoils the appearance of a sign so much as the dim reddish glow ob-

TABLE OF DATA AND CONSTANTS FOR CALCULATION OF SIGN WIRING CIRCUITS.

Size of wire, B. & S.	Amperes, rubber insulation.	Amperes, other insulation.	Values of K D-C.	Values of K A-C.
14.....	15	20	.00526	.00585
12.....	20	25	.00334	.00367
10.....	25	30	.00208	.00232
8.....	35	50	.00131	.00145
6.....	50	70	.000823	.000913
5.....	55	80	.000652	.000725
4.....	70	90	.000518	.000575
3.....	80	100	.000410	.000456
2.....	90	125	.000325	.000362
1.....	100	150	.000257	.000287
0.....	125	200	.000205	.000227
00.....	150	225	.000162	.000180
000.....	175	275	.000130	.000143
0000.....	225	325	.000102	.000113

tained when the lamps are burned under voltage. The fire underwriters' regulation as to size of wire in order that fire risks from overheating will be eliminated must, of course, be adhered to, but in most cases if wire of sufficient size to prevent an appreciable voltage drop is used this factor is taken care of automatically.

Before designing the wiring certain data must be available, as follows: (1) Number of lamps in multiple; (2) wattage of lamps; (3) voltage of lamps; (4) kind of power (a-c. or d-c.); (5) allowable voltage drop; (6) size of wire to be used, and (7) length of feeders in feet. Knowing the first four and any two of the last three factors, the remaining factor can be obtained by calculation. From the number of lamps and wattage of each, it is possible to determine the



Wiring Connections for 11-Volt Lamps With Transformers on A-C. Service.

total wattage which, if divided by the lamp voltage, will give the necessary current in amperes.

From the accompanying simple formulae and tables the calculations for any sign circuit can be determined.

$N \times w = W$, where N is the number of lamps in multiple, and w is the wattage of each lamp.

$W/E = I$, where W is the total wattage, E is the voltage of the lamps, and I is the current in the circuit in amperes.

$D = KIL$, where D is the voltage drop, L is the length of feeders in feet, and K is a constant dependent on the size of the wire and whether a-c. or d-c. service is employed.

The use of these formulae and the table is illustrated in the following problems:

Case 1.—Size, number and voltage of lamps are known. Feeders of fixed length and size are installed. It is necessary to determine the voltage of supply which will cause the lamps to operate

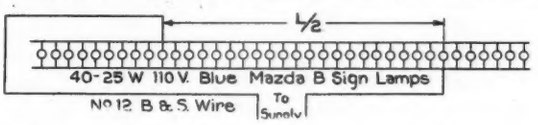


Diagram Showing Wiring Connection for 110-Volt Lamps on A-C. or D-C. Service.

at rated voltage. The numerical data is as follows: Number of lamps in multiple = 40; wattage of lamps = 25; voltage of lamp = 110; power is a-c.; size of wire is No. 12, and length of feeders = 100 ft. It is required to find the drop between the lamps and power source.

Total wattage = $40 \times 25 = 1000$ watts.
Total current = $1000 \div 110 = 9.1$ amperes.
K for No. 12 wire on a-c. service = 0.00367.
$D = K \times I \times L = 0.00367 \times 9.1 \times 100 =$ 3.34 volts. Therefore, the voltage furnished at the source to give 110 volts at the sign must be 110 plus 3.34, or 113.34 volts.

Case 2.—Size, number, wattage and voltage of lamps are known and the length of feeders and voltage of supply are fixed. It is necessary to determine size of wire which gives the permissible drop. The numerical data is as follows: Number of lamps in multiple = 40; wattage of lamps = 25; voltage of lamps = 120; voltage of supply = 125, d-c.; allowable drop in volts = 5, and length of feeders = 150 ft. It is required to find the size of wire to be used for feeders.

Total wattage = $40 \times 25 = 1000$ watts.
Total current = $1000 \div 120 = 8.33$ amperes.
$D = K \times I \times L$, or $K = D/(I \times L)$.
$K = 5/(8.53 \times 150) = 0.004$.

From the table the nearest size of wire which will satisfy the above conditions is found to be No. 12 B. & S., the factor K for which on d-c. service is found to be 0.00334. Therefore, if No. 12 B. & S. gage wire is used the voltage drop will be very close to 5 volts.

The application of certain standard lamps to sign lighting has been outlined in the text and the accompanying essential technical data is presented in tabular form as an aid to the designing engineer.

Even if it were possible to develop and utilize at once every possible economic waterpower resource in America, the total energy thus made available would replace only a small part of the horsepower now derived every year from coal. While development of water power is important, experts point out that coal will remain the principal source to which the country must look for development of power facilities.

Electrical Construction Plan for Colorado River

Comprehensive Development Proposed to Regulate Stream Flow for Utilization of Available Water Power—Great Savings Result From Full Plan — Customer Ownership of Stock Provided For

By CHARLES HESTON PEIRSON*

Devastation of the Imperial Valley in southern California by floods from the waters of the Colorado river, the rapidly diminishing supply of oil and coal for the production of power, and the enormous economic loss in production from unworked mines, and from millions of acres of rich land which simply awaits irrigation to bring forth abundant harvests, is centering attention on the fact that this greatest of untamed watercourses on the North American continent must be immediately harnessed, either by the Government or by private agencies under what is practically an option held by the Government to take over the project at the expiration of a period fixed by the Federal water power law.

Even the most radical of corporationists have receded from the contention that private interests should permanently acquire rights to the natural power resources of rivers and streams. Between the corporation extremists, who desire to get permanent rights to the electrical product of the water resources of the Nation, and the advocates of absolute Government ownership, who maintain that the Government should withhold the development of these natural resources until Federal appropriations could be secured for the vast construction involved, the new water power law, which was the result of long and careful studies and concessions by the corporationists who have available the capital to do the job and in time to meet the demands for the electrification of all industries, and particularly the electrification of steam railroads, and those of the Gifford Pinchot School of Conservation, is generally regarded as a workable measure. It extends the short terms of water power leases, which made it impossible to secure capital for the millions of dollars of investment in the construction of power houses, which might be subject to practical confiscation at the end of a 15 or 20-year term, and retains to the Government the right to take back these developed properties at the end of 50 years by paying the net cost of their construction.

Based on the theory of immediately controlling the power resources of the Colorado river by existing agencies, the Southern California Edison Co. has taken the initiative. This company operates in a territory about equal to the war zone of Europe, and has an enormous market for power to supply irrigation and for the factories which are locating in proximity to the port of Los Angeles to supply wares to the enormous populations reached by Pacific shipping.

It is proposed by the company to erect a veritable mountain in the channel of the Colorado river, 75 miles above the Grand Canyon National Park, thus controlling its flow and making possible without danger of flood damage subsequent power constructions at points below, and to develop 2,500,000 hp. of electric energy at a total cost for power development and its transmission and distribution to individual consumers estimated at between $625,000,000 and $800,000,000, approximately twice the cost of constructing the Panama Canal.

The seeming broad margin between the minimum and maximum estimate is largely accounted for by allowances for the distance from the base of generation to which the power would be transmitted, and with certain reasonable latitude for unforeseen engineering and construction problems.

The ultimate development of the power resources of the Colorado river include the construction of power plants at Lee's Ferry, Marble Canyon, above the Grand Canyon, and at Diamond Creek, 50 miles below the Grand Canyon, which are included in the company's project, and the development of Boulder Canyon, which lies between Nevada and Arizona and which has been the subject of investigation by the Imperial Valley irrigation district and the Government reclamation service. It is estimated by Director Davis of the reclamation service that the Boulder Canyon dam will cost $55,000,000, to which the cost of power development, transmission and distribution of the power to consumers' premises would be added. Engineers estimate the total cost in excess of $200,000,000 for 600,000 to 700,000 hp.

There is unquestionably a great power resource in the Grand Canyon, but that being within the National Park, which is excluded from invasion by development projects, it has not been taken into consideration by either the public or private agencies which are surveying the resources of the Colorado river. The complete development of the electric resources of the Colorado river would result in producing 4,350,000 hp. of hydroelectric energy at a cost of approximately $1,250,000,000, or somewhat over three times the cost of building the Panama Canal.

*Charles Heston Peirson, the author of this article in the Los Angeles Examiner, July 16, 1921, for the past 15 years has been identified with the Southern California Edison Co. and its predecessor companies. Two plans are being advanced for harnessing the Colorado river: one is the proposal of the United States to build a dam at Boulder Canyon; the other is that described here. The immensity of the project is almost beyond conception, compared with existing reservoirs and plants. The proposed dam will impound more than 10 times the storage now held by the largest dam in the world—that of the Nile. A 1000-mile zone will be furnished with electricity. Applications have already been filed with the Arizona State authorities and the Federal Power Commsision by the Edison Co. for permits to begin operations.

Included in the zone of commercial distribution of power which the Southern California Edison Co. and other companies which will be associated with it in the project propose to develop are the states of Arizona, Nevada, New Mexico and Utah, more than one-half of Colorado, one-fifth of Idaho and Wyoming, with possibly large areas in northern Mexico. Within this zone dwell about 6,500,000 of the 110,000,000 population of the United States. That approximately 104,000,000 people would vote appropriations of $1,250,000,000 or three times the cost of constructing the Panama Canal, for the direct benefit of 6,250,000 people, is said by those who have studied the problem of Government development of the Colorado river within the life of the present generation to be a political proposition too remote to be considered on practical lines.

Reasons for Immediate Development of Hydroelectric Resources.

Reasons advanced for the immediate development of the electric resources of the Colorado river are that they would produce the equivalent of the annual consumption of 90,000,000 bbls. of oil, or 30,000,000 tons of coal. Upon this conservation of fuel depend many things, most important of which is the ability of the United States to maintain its merchant marine and its navy.

The world war brought about a change in fuel supply for all ocean-going craft, and the substitution of oil for coal renders it imminently essential that the petroleum products of the United States should be conserved for maritime use. For years Great Britain controlled the seas largely because she was in control of the coaling stations throughout the world. With the change from coal to oil burning on ships, England immediately set out to control the oil supply of the world, and has succeeded in doing so largely with money borrowed from the United States.

It is said that England has succeeded in this endeavor to the extent of being now in control of between 80 and 90% of the oil supply outside of the United States. The national demand for the merchant marine and navy of the United States is equal to all of the oil produced annually in California, and constitutes a new burden on the already overloaded market.

On June 29 Governor Thomas E. Campbell of Arizona transmitted to the governors of Colorado, Wyoming, Idaho, Utah, Nevada, New Mexico and California a communication from Edwin O. Edgerton, former president of the California State Railroad Commission, in which he presents the claims for granting permits for development of hydroelectric energy on the Colorado river at the points above and below the Grand Canyon.

This document, drafted and submitted by Mr. Edgerton, acting as counsel for the Southern California Edison Co. in its trans-Colorado river activities, is in response to a request made by Governor Campbell for details concerning the Edison project, made at the time the applications were filed.

Concerning the functions of the proposed distribution in the several states, Mr. Edgerton says: "The Southern California Edison Co. has initiated this project and expects to associate in the enterprise all of the power companies within the area of distribution in the several states named and all of these companies are under strict regulation, and with the creation of a new corporate entity it also will be under the same strict governmental regulation."

"It is proposed to mass the brains and long experience of the ablest men in the power business," continues the communication, "and to bring to this project the organized initiative of the power companies." John B. Miller, president of the Southern California Edison Co., it says, has given assurance that he will not permit any selfish interest to get into any position of direction of the policies of this project, but, on the contrary, that it shall be so framed and carried forward as to prevent any promotion, profit or financial exploitation of any kind, except a reasonable return on the money invested.

Stock Ownership by Consumers Will Be Invited, Say Company's Officials.

It is also stated on behalf of Mr. Miller that it is proposed to invite and encourage stock ownership in this enterprise by consumers and the public on similar lines to that of the company in selling a large amount of its stock in small blocks to consumers, and that this will effect in the Colorado river project a very real public ownership of the property through stock owned by consumers and the public throughout the Southwest.

From the melting snow on the Rockies the flow of the Colorado river is extremely variable and although the total quantity of water discharged in a season is enormous, the great part of this discharge occurs during a short period of high flow, while the snows are melting, followed during the remainder of the year by a long period of comparatively small flow. Both irrigation and the development of power require a continuously available reliable water supply very different from that of the uncontrolled river. The only way that the floods can be reduced and the low water flow increased is by the construction of reservoirs which store the floodwaters to supply deficiencies during the low water period. Any plan, it is claimed, to utilize the resources of the river, therefore, in addition to power plant installation and diversion works for irrigation must include provision for large storage reservoirs in the higher reaches of the river.

Edison engineers say that one of the most serious objections to the plans heretofore suggested for power developments on the Colorado has been that of their piecemeal character. Proposals to utilize some comparatively small part only of the total power have been made, but no adequate means provided for carrying out a comprehensive plan, each part of which would fit into and benefit all the other parts and result in the maximum utilization of the possibilities of the stream.

The Boulder Canyon development, they assert, is a plan well thought of and effective, but the same expenditure applied to a comprehensive plan can be made more productive. The high dam proposed at Boulder Canyon would regulate the river below that point and produce a large amount of continuous, reliable power, but the site is at the foot of the grade, so to speak. It regulates the river below it, but the only fall for

power purposes benefited by the regulated flow is that at the dam itself.

Additional Power Development Below Dam to Be Available.

No additional power developments are available below the dam, while the greatest fall in the course of the stream is above Boulder Canyon. According to these engineers, if the expenditure proposed for Boulder Canyon is made higher up the river at Glen Canyon, below which the river drops nearly 3000 ft. to Boulder Canyon, not only will a much greater reservoir be formed, providing more complete control of the river, but the regulated flow will make it possible to produce continuous reliable power from the whole 3000 ft. of fall instead of from the few hundred feet at the Boulder dam itself.

In other words, a reservoir at Glen Canyon will provide a regulated water supply for more than seven times as much horsepower as at Boulder Canyon, and on account of its larger size will be more effective for preventing floods and supplying water for irrigation.

Government and state regulation and control would, of course, supervise the financing, construction and the fixing of the rates charged for all the electrical energy produced. Under state regulation the public regulating bodies have jurisdiction over the issuing of all stocks and bonds, and it is their duty to see that the money derived from their sale is judiciously and carefully spent in construction. These regulating bodies also fix the rate charged for the current, this charge being based upon reasonable returns upon the money invested in the properties plus the cost of operation, which is largely labor, and also depreciation, which means their upkeep.

Benefits Which Will Be Derived From This Huge Project.

The benefits which the company claim will be derived from the Colorado river project and subsequent development which it makes possible are that 3000 ft. of waterfall will produce 4,350,000 hp., which is equal to one-half of the total hydroelectric power now generated in the entire United States; that flood control will be absolute, reducing the water discharged to that volume which may be safely carried within the natural banks, levees being practically eliminated; that provision will be made for irrigation of an additional 2,250,000 acres, of which 1,000,000 acres will be above the Grand Canyon and the balance below; that the storage basin will be over 200 miles in length, impounding more than 40,000,000 acre-feet of water, creating a navigable inland waterway in the state of Utah and making 300 miles of the river available for waterway commerce; that the area which may be served with power includes three-quarters of the state of California, the entire states of Arizona, Nevada and Utah, more than one-half of Colorado and New Mexico and one-fifth of Idaho and Wyoming, with possibly large areas in northern Mexico; that power may be used for the electrification of steam railroads as well as for commercial, agricultural, mining and municipal uses in the entire district; that the saving in fuel oil by the substitution of this hydroelectric power will amount to 90,000,000 bbls. per year, which is practically the present annual production of the entire state of California; that these savings in oil consumption will indefinitely extend the fuel life of our Navy and merchant marine, the vessels of which during the war were of necessity changed from coal to oil-burning types; that the Colorado river is the second largest river system of the country, having a drainage area of 250,000 sq. miles, Nature's arrangement of this stream for man's use is equaled by that of no other river in the world; that 93% of the run-off may be impounded above the storage dam, which will be 500 ft. in height, and that the increase in community wealth by this development will be equal to the total valuation of California for 1920.

The Southern California Edison Co. and the other corporations interested in the immediate development of the Colorado river claim that, by giving their consumers and the public opportunity to own as much of the equities of their respective organizations as it desires to buy, they are giving the public an opportunity to own the proposed development.

They claim that as the money is required for developing the Colorado river, a very large percentage of their consumers will hold a stock ownership in the project, and that it will be virtually owned by the people who consume its products, pending the time when, under the water law, the Government of the United States, if it so desires, may take it over.

ELECTRICALLY DRIVEN MACHINES IN MODERN BOX FACTORY.

All Power Requirements Supplied by Electric Motors Ranging in Capacity from 8 to 150 Hp.

By W. A. Scott.

The manufacture of wooden boxes in many industrial centers has become a business of considerable importance. It thrives especially in localities where lumber in the rough may be obtained by short haul on trucks or on tractor-drawn carts and trailers. The box factory at its best advantage is found where it is operated as an auxiliary to a large lumber mill from which material of a grade suitable for this purpose may be supplied.

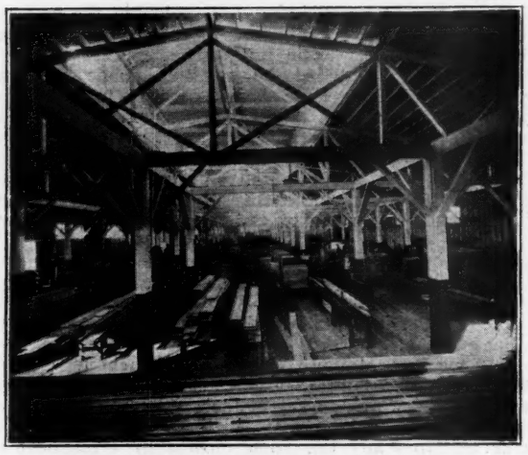
Demands are becoming greater each year for boxes required in packing green and dried fruit, for canned products, including vegetables, fruit, milk, fish and meat, and for hundreds of classes of merchandise. Those demands, which often comprise orders to be filled in a limited time, have resulted in developing special types of machines, equipped with electric drive, whereby the work in a box factory may be turned out with amazing speed. Some orders are for finished boxes and others are for box shook. The latter consists of planed lumber sawed and ripped to the dimensions required for boxes of specified sizes. These are tied in bundles for shipment to the consumer who puts the boxes together in his own packing plant. Shipping box shook, instead of the finished boxes, results in an economy in freight charges.

The illustration given herewith shows the modern box factory at the Bloedel-Donovan Lumber Mills, Ltd., at Bellingham, Wash. This factory is situated in the vicinity of that concern's large

lumber mills, and is run as a subsidiary thereto. Material for box making, consisting principally of hemlock and spruce boards in the rough, is hauled from the sawmill on 2-wheel carts drawn by gasoline-operated yard tractors.

Entire Power Requirements Supplied by Electric Motors.

The factory is equipped for electric drive throughout, the machines and tools employed requiring 41 motors of capacities ranging from 3



Modern Motor Operated Box Factory Located in Bellingham, Wash.

to 150 hp. and representing a total connected load of 700 hp. Central-station energy at a pressure of 2300 volts is received at the factory's outdoor substation which is equipped with three transformers of 100-kv-a. capacity and three of 50-kv-a. capacity. Energy for motor drive is stepped down to 440 volts, and an indoor transformer of 25-kv-a. capacity serves to step down to 110/220 volts for 3-wire lighting circuits.

Two 500,000-cir. mil. weather-proof feeder lines extend from the receiving station to the building, there connecting with three feeder lines of similar size leading to the 2-panel switchboard inside the building. The equipment at the distributing panels comprises a General Electric 1200-ampere, 2500-volt, type K-5 oil circuit-breaker, a similar circuit-breaker of 100 amperes capacity, ammeters, watt-hour meters and voltmeters, all meters being mounted upon the 2-panel switchboard. The entire load of the plant is checked by one curve-drawing instrument. The entire plant and building is wired both outside and inside with metal conduit. Illumination is provided by 150-watt type C lamps in 12-in. enameled steel reflectors made by the Benjamin Electric & Manufacturing Co. A special outlet is provided for an extension to most of the machines.

Material Handled on Gravity Rolls for Transfer.

The lumber hauled from the sawmill to the box factory is lifted from the carts and placed upon gravity rolls by a monorail hoist. The first machine in the process is a planer, driven by a 1200-r.p.m., 75-hp. Westinghouse motor. The next machine is a ripsaw that cuts the boards to the required widths. The boards then pass to a transfer platform equipped with three parallel rubber belts operated by a 10-hp. motor. By these transfer belts the boards are delivered to eight cut-off band saws, each one being driven by a Westinghouse 7.5-hp. motor. The mechanism is so controlled that the boards may be cut to any length required for a given order. The parts thus cut pass to 4 ripsaws operated by 5 and 10-hp. motors, whereby they are reduced to specified widths. The next step is to apply the resaws by which the boards are ripped from edge to edge—for instance, a 1-in. board may be so divided as to produce two boards 0.5-in. thick or four boards 0.25 in. thick. This work is done by one vertical resaw operated by a 50-hp. motor, a twin horizontal resaw, each of the twin saws being driven by a separate 40 or 50-hp. motor, and a single horizontal resaw driven by a 30-hp. motor. These are all band saws, the saw speed being from 8000 to 9000 ft. per min. In the case of the vertical resaw the motor is directly coupled and in operating the others the motors are belted to the machine.

Motor-Driven Machines Perform Final Operations.

The material leaving the resaws is ready either for assembling to make finished boxes or for tieing into bundles as box shook. The tieing in box shook bundles is performed by a machine operated by a 3-hp. motor and a small air compressor. That material not shipped in bundles is passed to the nailing machine by which the boxes are completed. Other motor-driven machines are operated to cut out recesses in the boxboards to serve as a hand hold, and putting cleats on the box ends to strengthen them. There are other processes, such as splicing, making tongue and groove joints and tennons, to which motor drive is applied.

A double-suction fan, driven by a 150-hp., 1200-r.p.m., direct-connected motor takes up the refuse from all machines in the plant through metal ducts that lead to the fan. All motors of 5-hp. capacity and less are controlled by General Electric FP-10 oil circuit-breakers; those of higher capacity are controlled by General Electric type I starting compensators.

Refuse from cut-off saws and ripsaws is passed by gravity to the basement room and carried by a belt conveyor and a chain-bucket conveyor to fuel bunkers. The data used herein was furnished by Earle M. Dennis, chief electrician for the Bloedel-Donovan mills.

ELECTRICALLY DRIVEN FREIGHTER PROVES SUCCESS.

Long Trip Completed in Record Time and With Good Saving in Fuel—Control Meets With Approval of Officers.

America's first electrically propelled cargo carrier, the S. S. *Eclipse,* recently completed her first ocean voyage with her new equipment—a trip of 26,500 mi.—without the slightest hitch of any kind to her machinery, and in one week's shorter time than was possible before the electric drive was installed. H. B. Taylor, chief turbine engineer of the U. S. Shipping Board, met the *Eclipse* and congratulated the officers of the boat on the fine performance of her equipment and

the complete success attending her initial trip.

The *Eclipse* left New York on Nov. 12. Her first stop was Port Said, Egypt. She then proceeded to Singapore and Java, took on a cargo and on March 23 left Bombay for her return. Both going and coming she encountered heavy seas, but maintained a speed of better than 10 knots for the trip and made a great saving in the amount of fuel used as compared with trips taken by her before her propulsion machinery was changed from the geared turbine to the electric drive.

Captain A. J. Shrader of the *Eclipse* declared as he left his cabin when the vessel docked that the trip had been the best in his experience, that not the slightest trouble had occurred in any part of the equipment. "There is no comparison between the electric drive on this boat and the geared turbine or the reciprocating engine drive," he said. "I have had considerable experience with the geared turbine propulsion and this beats it in every way. We made every port on schedule, maintained a speed of better than 10 knots for the entire trip, and I can say nothing but words of praise for the equipment." His remarks were duplicated by Chief Engineer Carageorge and by others on the ship.

The *Eclipse* was built at the Bethlehem Shipbuilding Corp.'s Union Iron Works, San Francisco, in 1918. Last summer her propulsion apparatus was changed to the turbine electric drive. Contrary to reports that special electrically trained men would be required to operate the vessel, the same crew which manned the *Eclipse* before the change was used and not the slightest difficulty was experienced. Engineers operated the vessel as easily as a motorman does a trolley car, its simplicity being one of the marked features of the trip.

EFFECT ON PUBLIC UTILITIES OF TAX-EXEMPT SECURITIES.

How Industry Suffers Through Constant Demands of Governmental Agencies Upon Capital Outlined at Pacific Coast Meeting.

Geo. L. Myers, assistant to the president of the Pacific Power & Light Co. and the Portland (Ore.) Gas & Coke Co., attended the 28th annual convention of the Pacific Coast Gas Association at Del Monte, Cal., as chairman of the Committee on Legislation and Taxation. Addressing the convention on "Tax-Exempt Securities," Mr. Myers spoke as follows:

The present fiscal policy of the Federal government, which has developed as a consequence of the vastly increased cost of government and the imposition of taxes at progressively higher rates upon large incomes, has produced a condition which is a serious handicap to business enterprise. This condition is the existence of an enormous and ever-increasing volume of tax-exempt securities issued by a great variety of governmental agencies. All industry suffers as a result of this large volume of tax-exempt securities and of the constant new demands of these agencies upon the reservoir of investment capital, regulated industry, such as the public utilities, suffering in particular degree. Under prevailing policies of regulation public utilities are limited to a return which makes it impossible for people of large incomes to invest in such securities in preference to the securities of government, which latter are exempt from the payment of taxes at the prevailing high rates. Therefore, public utilities have been obliged to forego badly needed capital expenditures for extensions and additions.

It has been the contention that to exempt governmental securities has been to the advantage of the government because it has made it possible to obtain capital at a less cost than otherwise would be the case. This contention is not denied. It worked no serious hardship to business enterprise or to the taxpayer prior to the imposition of high rates of taxation upon income, but under the changed fiscal policy of the Federal government it is constituting what Secretary of the Treasury Mellon correctly terms "an economic evil of the first magnitude." This is proving to be true in practice and principle.

It has been estimated that the saving to the government in the cost of capital has been offset by the loss of $600,000,000 a year in taxes from sources of large income. It has divided the investing public into two classes, those of large income who pay no taxes in proportion as they hold tax-exempt securities and those whose income is not large enough to be affected by the tax on taxable securities. It is only from the former class which has a substantial surplus of income over expenditures available for investment that any substantial volume of new money can be expected for business enterprise.

The requirements of Federal revenue are fixed and if a class exempts itself by the nature of its investment then either the individual or business enterprise must make up in direct taxation an amount equivalent to what such class would be otherwise obliged to pay, which means that those who do not benefit by exemption must pay an unfair proportion of taxes and a class which is better able to pay at the same rates of taxation and able to pay reasonably higher rates may become immune from any tax upon income by investment in tax-exempt securities to evade the higher rates of surtax upon income. Such exemption under the present fiscal policy increases the cost of capital to business enterprise, which cost is a part of the cost of production and which necessarily increases the rate or price for what is produced in service or goods. The cost of capital restricts or promotes production and if its cost is enhanced by excessive taxation, due either to the cost of government or inequitable distribution, then the rate or price for service or goods is correspondingly greater to the extent that the volume of production fails to meet the demand. Therefore, while the people may appear to gain from a less cost of capital to the Federal government, this gain is substantially offset by the economic loss to the individual and to business enterprise.

The Committee on Reconstruction and Production of the U. S. Senate has reported that the accumulated requirements of the public utilities for the past 4 yrs. amount to $2,000,000,000. The present normal requirements have been estimated to be from $500,000,000 to $750,000,000 annually. In order that the demands for added facilities for service may be met it is necessary not only that they be placed in a satisfactory earning condition to make the investment of capital attractive, but that the present unfair competitive situation created by our policy of taxation be corrected by a scheme of taxation adapted to reach sources of revenue that will place all securities upon a basis of fair competition, or an amendment to the Constitution to prevent the issuance henceforth by the Federal government and the states and their minor subdivisions of securities which are exempt from taxation.

The prospect for relief seems to lie in an amendment to our Constitution to prevent the issuance in the future of tax-exempt securities. The average requirements of public utilities, together with those of the railroads, industry in general and building, make it imperative in the interests of economic progress that there should be equal opportunity to secure capital from those of large income. It is not alone essential that public utilities should provide efficient service. The service must be sufficient, or in other words, there must be adequate facilities of service to meet the growing domestic and industrial needs. If the capital cannot be provided because of the limitations of regulation on the one hand and the cost of capital on the other, then our ill advised policy of taxation may yet force public utilities into public ownership and operation in spite of the public sentiment which seems to be opposed to such a policy, a result which would only aggravate the tax problem by still further burdening productive enterprise with an unfair proportion of taxes.

EDITORIAL COMMENT

Power-Factor Correction

There has been much attention given to the consideration of power-factor and its influence on equipment performance and costs of operation during the past year, and still it is impossible to say just what penalties are imposed in the form of increased cost or decreased quality of service as a result of poor power-factor. Many discussions of power-factor problems have in the past failed to command attention because of the lack of specific data on which to make calculations on a dollars and cents basis. High power-factor or low power-factor is of little importance unless by some means it influences the ultimate cost of supplying service or results in the giving of service of such a quality as to be of reduced utility to the ultimate user.

On other pages of this issue H. C. Croy presents certain features of the power-factor problem, and supports his discussion with actual data. Mr. Croy presents three possible methods of improving the existing conditions and shows estimates of the costs and resulting economies involved. Two of the plans presented involve the provision and maintenance of additional equipment on the central station system, while the third scheme contemplates the use of equipment on the property of the power using customer. Each plan has certain merits and certain objectionable features, but they are all aimed to overcome the influences of low power-factor on one or more parts of the central-station system and so overcome all or part of the difficulty.

Correction of power-factor is of interest to the purchaser of service just as much as it is to the central station company. In fact, the customer is probably more concerned with the problem than anyone else. If line regulation is poor as a result of disturbing conditions the customer has to endure the hardship of poor service, and if line and station capacity are insufficient to care for the demand the customer must go without service entirely or must be satisfied with only a limited supply. The company is limited, of course, in power output and in returns by the influence of low power-factor. This limitation of output may be overcome by either installing extra generating and transmitting equipment or by correcting the evil at the source. Both solutions of the problem call for added investment. As Mr. Croy has pointed out, there are several ways to remedy the evil at or near the source.

In the end the object to be obtained in the study of any public service problem is to find a way to supply suitable service at a minimum cost. If the study does not result in a reduction of costs for a given quality of service it has been a failure. Articles like that by Mr. Croy are valuable in that they carry the discussion of a technical problem through to an answer in dollars. A discussion so carried through is particularly valuable because it is open to criticism from the start to the conclusion, and if it contains flaws they may be discovered and segregated for study or correction.

The Sign Lamp

The sign lamp has within recent months taken a new position with respect to the central station industry. Not so long ago the problem of the sign lamp manufacturer was to produce a lamp of low wattage. Now the problem is to produce a lamp of as high capacity as possible in the limited space that may be assigned to such a unit. Formerly the load produced by a sign was of a rather limited size because of the small capacity of the lamps used, but now with the larger lamps the load may be from 5 to 20 times its original value.

However, this greatly increased revenue feature is not the only point recommending the electric sign to the favorable attention of the central station manager. The sign, as has been pointed out before in ELECTRICAL REVIEW, advertises the electrical industry to the public just as effectively as it advertises for the merchant who has it installed. It is up to every central station man to get behind the sign business and push. Co-operation brings success in any worthy industry, and we know of no other industry more worthy than that which includes the sign and central station business.

Electric Power Improvements

One of the essentials in remodeling a plant or electric power service is the ability to concentrate upon particular features of the local situation, spotting the weak points of the existing service and emphasizing the fitness of the electric drive as a means of bettering the conditions. The experienced engineer detects these weak points almost by instinct, and by constant practice even the man fairly new to the work can acquire much skill in their location. The winning proposition to install electric service is often built around one or two features of an established mechanical

drive which the factory or plant owner has never realized to be grossly inefficient or unsuited to its particular application.

Investigation of steam leaks in old engines and of excessive condensation in cylinders and piping is a fertile field for study, as is the determination of power losses in belts, shafting and quarter-turn pulley combinations. Few factory owners realize the amount of coal required to transmit their mechanical power from an engine to the line shaft of a distant department compared with the additional demands of the productive load at the machines. A preliminary survey of a plant should suffice to "tip off" the power engineer to the existence of a relatively large friction load, and by the simple expedient of taking indicator cards during the noon hour and in the full working periods the basis for many a clinching electric power proposition is at hand. It is well for the engineer in charge to realize that it is not always necessary to present the management with the ultimate figures of estimated electric-service economy in order to win the authority to make desirable changes. That is, he may carry a power survey far enough to demonstrate a highly favorable showing by the adoption or extension of electric drive, but it is better to rely upon an underestimate of the profits of improved service than to promise large immediate savings which can reasonably be expected if the equipment is given a fair show, but which may not be realized if it is subjected to abuse or improper service demands.

It is in working along such lines that concentration of effort pays. The handling of fuel in the existing plant may be extremely inefficient; untoward prices may be paid for water or the disposal of ashes; inadequate maintenance may be causing frequent costly breakdowns of pumps and engines, or the intermittent service may be a factor in the high cost of operating the mechanical plant. Some of these features often can be improved without the use of electric motors, but the wise engineer will confine his efforts to suggestions which will tend to bring about the best service possible rather than to pointing out desirable mechanical rearrangements of old plants run by competitive motive powers.

No one can study electric power applications long without being convinced that even a rehabilitated mechanical plant can scarcely hope in the long run to make as good a showing on total yearly cost as the same plant equipped with a properly designed motor drive; but let the responsible engineer keep close control of his promises as to sweeping economies which may result from the adoption of electricity. Far better is it to let the management discover some of these economies in its lessened power bills, so long as a sufficient margin demonstrated by the electric-service estimate leads it to decide in favor of a modern type of installation. The manager who finds for himself unexpected or unpromised profits is sure to be pleased, while the miscarrying of a reasonable promise may result in an entirely unwarranted adverse opinion.

Free Zones, Foreign Trade and the Tariff

At the American Bankers' Association convention, recently held in Los Angeles, Henry M. Robinson, former member of the Supreme Economic Council at Paris, and commissioner of the United States Shipping Board, now president of the First National Bank of Los Angeles and the Los Angeles Trust & Savings Bank, presented the problem of free ports and free zones, and discussed the Jones bill now before the Senate and the House.

This address dealt with the difficulties of maintaining both a protective tariff and a merchant marine and discussed the free port and free zone question in its relation to the national ability to maintain both. It was considered of particular importance because it is the first presentation to American business of the free port and free zone measure which will be incorporated in the pending tariff legislation and will affect the entire business practices of the United States. It will be noted that the Jones bill has been amended to prohibit manufacturing within free zones. This is in the interest of interior cities.

Mr. Robinson—an international figure whose opinion on national affairs is widely recognized—spoke as one interested both in a protective tariff and in foreign trade, and pointed out the apparent inconsistency of attempting to develop both at one and the same time, stating that it is only through the establishing of a free port and a free zone policy that the foreign trader and the protectionist can meet on common ground and the ends to which both are working can be accomplished.

After pointing out that the Jones bill, as now amended, provides necessary machinery for the creation of foreign trade zones in, or adjacent to, American ports of entry and authorizes the Secretary of Commerce to grant to states, municipalities and their legal subdivisions the privilege of establishing such zones, Mr. Robinson summarized the provisions of the bill. He pointed out that, whereas, under the terms of the bill both foreign and domestic merchandise may be brought into a free zone and there be broken up, assembled, mixed with foreign or domestic merchandise or otherwise manipulated for re-export, direct manufacturing, as such, may not be carried

on within the proposed districts; this in order to meet the wishes of interior communities and to allay their fears as to seaboard manufacturing competition.

"Under the terms of this act," Mr. Robinson said in part, "no duty is to be applied to merchandise delivered from ship to wharf within a free zone unless some part or all of it is taken out for domestic consumption, at which time it will pass through the Customs House and be subject to regular duty. In other words, we may, within certain districts within our ports of entry, be a free-trade nation and at the same time protect our own domestic markets from a flood of cheaply manufactured European and Asiatic goods.

"It is axiomatic that, for the protection of the American manufacturer, a method must be provided for the maintenance of a merchant marine which will carry abroad the surplus of American manufactured goods; otherwise, these goods must continue to back up upon our own markets and thereby reduce the earnings of our manufacturers, the profits of our merchants and the earnings of American labor itself.

"There is appearing from time to time in certain publications the suggestion that most of our products are consumed at home and that only about one-seventh is available for export and, hence, that our foreign trade is a relatively unimportant factor in our national prosperity. Accepting these figures as true, economists generally agree that a surplus is the controlling factor. Is it not, therefore, reasonable to assume that it is the backing up of our manufactured surplus and our inability to sell abroad that has brought about our unemployment situation?

"Since the beginning, any nation that has engaged with any appreciable degree of success in international commerce has been either on a free trade basis or has maintained one or more free ports or free zones. For years, however, we as a nation have maintained a high tariff and most of the time a very high protective tariff, and for half a century our flag has been a comparative rarity upon the seven seas.

"It is true that under the present law imported merchandise may be impounded in bonded warehouses and withdrawn for transshipment, or may be impounded, withdrawn and manufactured and then transshipped in foreign trade with a drawback of the customs paid. This plan was intended to meet the needs of world trade but is nearly inoperative and utterly fails of accomplishing the main purpose in that the time consumed in vessel delays and in the unwinding of red-tape militates against such an operation.

"A free zone would permit the prompt unloading of a ship within the boundaries of the zone without any of the long delays that grow out of the Customs regulations. If any part of the cargo is intended for domestic consumption this merchandise will be passed from the zone through the Customs House instead of holding the ship until all the merchandise is checked and customs paid.

"It is to be recognized that ships other than those under our flag will have the same advantage in our ports, but it is fair to assume that ships under our own flag through a period of time will touch more often at our ports than ships under other flags and to that extent, at least, there would be a factor for improvement in the cost of the operation of American vessels. Another great advantage in the operation of our marine would be the fact that so-called 'triangular voyages' could be made and cargoes moved to our ports, only a part of which would be intended for domestic consumption.

"The problem of American ships has been that, while we have merchandise for export shipment, only too often it is necessary for the ships to return in ballast. The British, a free trade nation, on the other hand have until recently been able to fill their unoccupied space in their outward bound ships with coal for foreign countries and for bunkering, returning with cargoes of commodities from foreign countries—cargoes partly for home consumption and partly for transshipment to other countries—transshipments made without any regulatory practices that result in serious delays. This, too, because of free port zones, was equally true in the case of Germany before the war.

"The establishment of free zones for America has been under discussion for many years. Shipping men naturally have been strongly in favor of it. They take the position that the principal advantage to the merchant ships is the ability to bring in full cargoes, or at least larger cargoes than present conditions allow, the bulk of which will be for transshipment in American bottoms to other ports in connection with shipments of domestic merchandise.

"Should the Jones bill become law our protection principle will be conserved because, otherwise, the belief that we should engage in foreign trade may in the course of time result in a marked modification of our tariff laws, and this may not be necessary if we can maintain our foreign trade and our merchant marine through the medium of these free zones."

While ELECTRICAL REVIEW is not prepared at this time to make any recommendation as regards this legislation, the above excerpts from the discussion by Mr. Robinson are given as a matter of information to its readers in order to guide them in reaching their own conclusions and planning their own actions.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

POWER SALES BUREAU COMPILES HEATING DIRECTORY.

Industrial Heating Division of N. E. L. A. Bureau Seeks Information to Aid in Listing Lines of Equipment Now on the Market.

The Industrial Heating Division of the Power Sales Bureau of the National Electric Light Association has in preparation a directory of manufacturers and users of industrial electric heating equipment.

Manufacturers who produce such electrically heated equipment as steel furnaces, nonferrous furnaces, heat treating furnaces, japanning ovens, drying ovens, core ovens, commercial bread-making ovens, welding, rivet-heating or electrochemical equipment, are advised to get in touch as soon as possible with R. T. Kaighin, Cleveland Electric Illuminating Co., Cleveland, and furnish him with data on any of the above equipment which they may manufacture.

It is the intention of the committee to make the directory as complete and valuable as possible, and to that end the co-operation of the manufacturers is earnestly sought. The committee also intends to give a list of installations of each kind of equipment so that, if a power salesman of a central station has a prospect for a certain kind of furnace, he can look up a similar installation nearby and show it to his prospective customer. The work should be valuable to central station interests and manufacturers alike.

ILLUMINATING GLASSWARE GUILD TO MEET NEXT WEEK.

Artistic Value of Illuminating Glassware and Incandescent Lamp Industry Among Important Subjects to Be Discussed at Cleveland.

"The Incandescent Lamp Industry," by S. E. Doane, chief engineer, National Lamp Works of General Electric Co., Cleveland, and "The Artistic Value of Illuminating Glassware," by M. Luckiesh, director of applied science, Nela Research Laboratories, National Lamp Works of General Electric Co., Cleveland, are among the important subjects to be discussed at the October meeting of the Illuminating Glassware Guild to be held Wednesday and Thursday of next week in the engineering building at Nela Park, Cleveland. The program arranged for the meeting follows:

Wednesday, Oct. 19, 9:45 *a. m.*—Meeting called to order by President Blumenauer; automatic roll call; address of welcome by W. M. Skiff, manager, engineering department, National Lamp Works of General Electric Co.; address on "Price Changes and Business Prospects," by Col. Leonard P. Ayres, vice-president, Cleveland Trust Co.; reading of minutes; president's address; report of the treasurer on general Guild fund; report of the treasurer on special group fund; report of the business manager, including presentation of trade statistics; discussion of conditions in the industry as seen by the members. Each member will be asked to discuss briefly conditions in the industry as he sees them under the following headings: (1) Present conditions and (2) Outlook for future.

Wednesday, Oct. 19, 1 *p. m.*—Luncheon served in the Nela dining rooms.

Wednesday, Oct. 19, 2 *p. m.*—Address on "The Incandescent Lamp Industry," by S. E. Doane, chief engineer, National Lamp Works of General Electric Co.; inspection trip through Nela Lamp Division, Nela Laboratories and Pitney Glass Division.

Wednesday, Oct. 19, 7:30 *p. m.*—Meeting and dinner of the board of governors at Hotel Cleveland.

Thursday, Oct. 20, 10 *a. m.*—Address on "The Legal Aspects of Association Work," by H. A. Couse, counsel, National Lamp Works of General Electric Co.; discussion on "Purposes and Development of Our Association," led by Charles R. Stevenson; address on "The Artistic Value of Illuminating Glassware," by M. Luckiesh, Nela Laboratories, and presentation of final draft of the uniform cost system.

Thursday, Oct. 20, 1 *p. m.*—Luncheon served in the Nela dining rooms.

Thursday, Oct. 20, 2 *p. m.*—Report of the Merchandising Committee by W. F. Minor, chairman; report of the Design Committee by E. B. Gillinder, chairman; report of the Trade Customs Committee by John Beiswanger; report of the Standardization Committee by E. H. Peck, chairman; report of P. W. Jenkins on the next Lighting Fixture Show; new business; unfinished business and adjournment.

WESTINGHOUSE BUSINESS MAKES A SATISFACTORY SHOWING.

Recent reports indicate that the Westinghouse Electric & Manufacturing Co. is in a better position at present than general conditions might show. Billings for the current year have been estimated at $125,000,000. Incoming business is running at the rate of $100,000,000 a year, a decrease of 35% from the previous year. Orders, as a whole, are said to average 65% of last year's volume. Receivables, which stood at $42,248,312 at the close of the fiscal year ended March 31, 1921, have been reduced about 20%, being at present about $34,000,000. Inventories have been reduced a little better than 12% from the $80,724,389 on March 31.

Recently opinion was requested from the managers of the 15 districts into which the company's territory is divided, as to trend of business during the next 6 mo. Only one believed business would decrease over the period, while seven were satisfied of better business and the other seven believed business would hold up. The lamp business has increased recently and as winter approaches each month is expected to do better.

There has been considerable discussion as to cancellations of orders for electrical goods. The Westinghouse company's cancellations are stated to have been under $1,000,000 up to Sept. 1. That part of the navy program which Westinghouse contracted to carry out has not been cancelled, in fact there is suggestion in certain quarters that the contracts be completed, allow-

ing company interest on money tied up in materials. Certain railroads, which have been negotiating with Westinghouse for some time continue plans for going ahead with electrification. If these plans are consummated it will mean considerable business from two roads in particular. The average employment at Westinghouse plants for the 5 mo. to Aug. 31, for all companies was 30,000, as compared with 45,000 men last year.

PUBLIC RELATIONS DISCUSSED BY EMPIRE ASSOCIATION.

Electric Power Situation in New York State and Serving the Public Among Subjects Presented at Lake Placid Meeting.

The largest and most enthusiastic convention ever held by the Empire State Gas and Electric Association took place at the Lake Placid Club, Lake Placid, N. Y., Oct. 6-7. The combination of a record attendance, excellent papers and ideal weather, added to the natural attractions and recreation facilities of the Lake Placid Club, so pleased the delegates that it was unanimously decided to hold next year's convention at the same place, if possible. The program of the convention was so arranged that the mornings were taken up by meetings and the afternoons left open for golf tournaments, boat rides, mountain climbing and other recreation.

The Thursday morning meeting was called to order by H. W. Peck, president of the Association. After the president's address, reports of the treasurer, Auditing Committee, Advisory Rate Committee and Accounting Committee were received. H. M. Addinsell, of Harris, Forbes & Co., delivered an informal address on the subject of "Public Relations as a Factor in the Value of Utility Securities."

Thursday evening at 7:30, a dinner was held and immediately thereafter the delegates adjourned to Forest Hall where the American Gas Association's film, "The Spirit of Service," and the National Electric Light Association's film "Behind the Button" were shown. Col. John P. Hogan, of the New York Water Power Investigation, gave an interesting illustrated talk on the subject of "The Electric Power Situation in New York State." The Con-Gas Quartette, which had led the singing at the dinner, delighted the audience by several selections.

William A. Prendergast, chairman of the Public Service Commission, spoke at the Friday morning session. He was followed by Loyal S. Wright, who gave an address on the subject of "Serving the Public." Reports of the Gas, Electric and Commercial Sections were received, as well as progress reports by the Electric Meter Committee and the Committee on Construction on State Highways. The meeting was concluded by the election of officers and a short address by E. H. Rosenquest, the incoming president.

The officers elected for the ensuing year are: President, E. H. Rosenquest, president, Bronx Gas & Electric Co., Westchester, N. Y.; first vice-president, E. H. Beals, attorney, Buffalo, N. Y.; second vice-president, S. J. Magee, vice-president, Associated Gas & Electric Companies, Ithaca, N. Y.; treasurer, W. J. Welsh, president, New York & Richmond Gas Co., Stapleton, N. Y., and secretary, C. H. B. Chapin, Grand Central Terminal, New York City.

NEW YORK SECTIONS OF ENGINEERING SOCIETIES TO MEET.

The first meeting for the administrative year 1921-1922 of the New York sections of the four national engineering societies—the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Society of Civil Engineers—will be a joint affair to be held in the Engineering Societies building, 29 West 39th street, New York City, Wednesday evening, Oct. 19.

The subject will be the "Financing of Large Engineering Undertakings," and the speakers, Arthur B. Leach, A. B. Leach & Co., bankers, and Philip Cabot, White, Weld & Co. Other prominent men in the financial field have been invited to present their views, while John H. Delaney, former construction commissioner of New York, and J. H. Williams, Day & Zimmerman, have promised to take part in the discussion that will follow the addresses.

INTERNATIONAL CHINESE-AMERICAN CONFERENCE AT DETROIT.

Recognition of Constitutional Government of South China Vital to Welfare of American Business and Advancement of China.

By F. G. Bolles,
Director of Research, International Trade Press, Inc., Chicago.

A gathering of importance to American electrical and other commercial interests was held at Detroit, Oct. 8 to 10, when nearly 500 delegates from North and South America, Cuba, and the Hawaiian Islands organized the International Chinese-American Conference. This conference has for its immediate purpose the securing of recognition of the Canton government by the seating of its delegates at the forthcoming Disarmament Conference to open at Washington in November, but plans were also discussed and contracts are under negotiation for establishing new industrial plants in China under American management.

Resolutions were formulated and forwarded to President Harding requesting that delegates from South China be seated at the Disarmament Conference. It is pointed out that more than 200,000,000 Chinese have sworn allegiance to the Canton government and Dr. Sun Yat-sen, president, and that any agreements made with the Peking government, referred to by the *Far Eastern Review*, printed at Shanghai, China, as being "the worst type of predatory militarism" and a "farce upheld by the powers," would not represent China nor would such agreements be recognized by the Canton government.

It is claimed that "the Peking government has lost its last vestige of nominal jurisdiction over the northern provinces and, being the puppet of the Tokio government, she is no longer recognized

by the Chinese themselves as the government of China. Since the unconstitutional dissolution of the National Assembly in June, 1917, no *de jure* government has existed in Peking. Hsu Shih-Chang is only a self-titled president of the historical capital, having no legal basis to his election. On account of the illegality and incompetency, the Peking government is on the verge of collapse and, hence, proving itself not even a *de facto* government.

"Technically the constitutional government of China has not been recognized by the Powers of the world; nevertheless it is a body politic occupying a vast territory of nearly 1,000,000 sq. mi. and commanding the obedience of over 200,000,000 people and, moreover, has its own 'reciprocal will.' In point of international law, since the election of Dr. Sun Yat-sen to the presidency at Canton last May, the constitutional government has been a *de facto,* if not a *de jure,* government. And according to the principles of recognition practiced by the United States it should be recognized.

"In view of the forthcoming Disarmament Conference to be held at Washington, the recognition of the constitutional government of China is of immediate importance in the settlement of the Far Eastern question in relation to the national safety of the United States. Therefore it is absolutely necessary to see to it that the Chinese delegation participating in the Conference will be truly representative of the Chinese republic so that the conference will not become a farce so far as China, the center of Far Eastern politics, is concerned. From the fact that the Peking government cannot and will not speak for China it is evident that the constitutional government of China should be accorded a seat at the conference in order that the problems of the Far East will be properly and legally settled; the open door policy of John Hay will accordingly be maintained; the American economic and commercial interests in China will be safeguarded, and above all the goodwill between the two republics will last forever. Thus China will be given justice, America will enjoy peace, and the Far Eastern question may not become a problem as that of the Near East which precipitated the great war. Can the United States afford to delay her recognition of the constitutional government of China and not accord her a seat at the Washington conference?"

Dr. Ma Soo, envoy of the Canton government at Washington, said:

"At Peking the government of the so-called Chinese republic is controlled by the Japanese militarists. There is ample proof that Japan is meddling in Chinese affairs. In Canton, where Dr. Sun rules, any one can witness the blessings brought by a safe and sane democratic government—the kind which Dr. Sun wants to extend to all China. Dr. Sun visions China as the America of the Far East. There will never be a yellow peril such as jingoes have conjured up in this country from time to time if Dr. Sun is aided by America. I am enthusiastic over the loyalty of American Chinese to America. This is a fulfillment of the prophecy of Dr. Sun that the Chinese people are capable of ruling themselves in a democratic way and are intent on seeking friendships with democratic peoples of the Occident rather than in making a kaiser-like war on the Americans and Europeans with a desire to establish the supremacy of the 'yellow' peoples. China is a giant which no longer sleeps. It has both eyes open and is about to rise as the world's champion of democracy and take its stand beside America and other democracies of the earth."

The people of South China have set up a constitutional government of their own and owe no allegiance to the Peking government. Their leaders are such enlightened men as Dr. Wu Ting-fang, who was twice Chinese minister to the United States and is well known in this country, and Dr. Sun Yat-sen, the "father" of the Chinese republic, who resided in the United States for 10 yrs. off and on. It was in the United States that Dr. Sun Yat-sen imbibed the ideas of popular government, which caused him to return to China and establish a republic there. The leaders of the South China republic control the six largest and most important provinces in China and have the sympathetic support of three other provinces.

The Peking delegation to the Conference cannot and will not speak for South China. The people of South China—half the people of all China—will not recognize decisions assented to by the Peking delegates. They should not be expected to. The Peking government cannot bind the independent southern government. Nor can it represent that government.

As the Peking government cannot speak for the whole of China and, in fact, cannot carry out any undertakings entered into for the whole of China, is it right or just that South China should not be represented? Unless President Sun Yat-sen and more than 200,000,000 people united in the South China republic are invited to send representatives to the Conference, the writer, who attended the Detroit meeting in company with C. A. Tupper, president of the International Trade Press, Inc., feels that China's participation will be a farce and the gravest injustice will result.

The South China Government under President Sun Yat-sen comprises the following provinces: Kwangtung, 32,000,000 population; Kwangsi, 5,500,000 population; Kweichow, 7,700,000 population; Szechuan, 69,000,000 population; Yunnan, 13,000,000 population; Hunan, 22,500,000 population, and the independent provinces of Chekiang, 21,000,000 population. The following two provinces will soon be under the South China government: Kiangsi, 27,000,000 population, and Fukien, 23,900,000 population.

If this great section of China, with a population of 221,600,000, is not represented at the Washington conference how can the Far Eastern question be settled? How can it even be justly discussed? This question is one of great importance not only to the Chinese themselves, but also to American business interests including engineering-construction and electrical industries, for unless it is promptly and permanently settled vast enterprises in which the commercial interests of both nations are vitally concerned will be indefinitely postponed. There is in China at the present time a remarkably good opening for American enterprise and American technical skill, including the equipment and operation of new industries in the Chinese republic.

The sessions at Detroit were attended by representatives of some of the largest American industries, as well as by many technical and financial experts who have been engaged in various parts of the United States and Canada in gathering information for use in establishing or operating plants in China, and the sentiment among them was unanimous as to the urgent need of recognition of the constitutional Chinese republic by the United States and the allied powers. During the conference many facts were brought out concerning construction work and industrial expansion in South China, including the growing use of electric power. At Canton, for example, these include the new turbine plant of the Kwangtung Electric Supply Co. and the building of an electric street car line on the site of the old wall by the Kwangtung Tramway Co., the erection of seven large modern hotels, the building of two 8-story department stores by the Sincere Co. and the Sun Co., the extension of the Canton waterworks and present operation of factories for the manufacture of textiles, knit goods, underwear, etc.; also foundries, boat-building plants, etc. Other factories are under contract to be built within the coming year.

A NEW COMPLETE LIGHTING SYSTEM FOR KANSAS CITY.

Contract Just Signed Will Give Missouri Municipality One of the Most Modern Lighting Systems in the United States.

Kansas City will be one of the first cities in the country to adopt a uniform system of modern ornamental street lighting on a large scale, and incidentally this improvement will mean the displacing of 2000 gas posts with which the residential section of the city is now lighted, as well as a number of electric lights of the cluster and overhead pendent type.

The city has just contracted with the Kansas City Light & Power Co. for the installation of approximately 7000 lamps in Novalux units, and it is expected that by the time they are installed the number will be doubled in order to keep step with the progress of the city, the residential districts of which are rapidly expanding. An initial order for 2000 Novalux units has already been placed with the General Electric Co. and additional ones will follow as the work progresses.

Some years ago there arose in Kansas City a demand for ornamental street lighting. The business district is pretty well covered by street car lines, and therefore it was decided to utilize the trolley wire standards for holding the lamps. A cluster of four globes, each containing a 100-watt multiple lamp, was placed on each standard. Approximately 1200 trolley poles were equipped in this way, the whole constituting what was called the "Bright Way Lighting System."

Outside the business district, and between it and the residential sections, there is a small zone which for a number of years has been lighted by 4-ampere magnetite arc lamps of the pendent type and G-E Form 6 Novalux fixtures equipped with 600-cp. lamps and band refractors. The residential section has for years been lighted entirely by gas, using several thousand gas lamps. The recognized shortcomings of the cluster lighting, together with the poor results obtained from the gas lamps, resulted in a popular demand for better street lighting.

The Chamber of Commerce took up the matter and started an agitation for correcting this condition. A "Get It Done" committee was appointed, and after various reports on the subject had been made the city, the Chamber of Commerce and the Kansas City Light & Power Co. united their forces to provide a modern street lighting system. The result is the new installation authorized and just announced. The cluster lamps now in use on the trolley poles will be replaced by an ornamental bracket supporting a Form 8 Novalux unit with alabaster rippled globe and metal canopy.

The gas posts will be supplanted by iron standards of Flemish pattern which were designed by the General Electric Co. and will be manufactured by the King Manufacturing Co. of St. Joseph, Mo. These will be equipped with G-E Form 16 Novalux units, some of which will be furnished with No. 107 alabaster rippled globes and metal canopies and others with the No. 97 diffusing globe and metal canopy. The alabaster rippled globes are of clear glass rippled with a flashing of opal. The ripple gives life to the "dead" light—the light from an incandescent lamp as contrasted with that of a luminous arc—and the opal gives diffusion. All of these fixtures are to be equipped with 400- and 600-cp. lamps, the majority using the latter size.

All of the units will be of the *IL* transformer type for "safety-first" reasons, making it impossible for anyone to be injured in replacing lamps, cleaning glassware, etc. The lighting company plans to maintain the new system in the best of condition and is having constructed a motor truck which will be used exclusively in cleaning the glassware of the lamps.

WEST VIRGINIA ASSOCIATION TO MEET NEXT WEEK.

The annual convention of the Public Utilities Association of West Virginia will be held at Charleston, W. Va., Oct. 20-21. A. Bliss McCrum, 514 Charleston National Bank building, Charleston, secretary, advises that the organization has done very well this year and while the number of companies in the Association is not large most of the bigger companies in the state eligible to membership are members, these including electric railway, electric light, heat and power and water companies.

LEHIGH VALLEY SECTION, A. I. E. E., MEETS AT ALLENTOWN.

The Lehigh Valley section of the American Institute of Electrical Engineers held its first meeting of the fall and winter season at the Hotel Allen, Allentown, Pa., Thursday evening, Sept. 29. The regular session was preceded by a dinner at 6:30, at which about 60 members and guests were present. Following a short business meeting, H. W. Smith, electrical engineer with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., gave an interesting illustrated lecture on the subject of "The Distribution

of Electrical Energy." Major Charles Hodge of the Pennsylvania Power & Light Co., Allentown, was elected chairman of the section to succeed L. B. Brooks. The organization received its charter in May last, and this meeting was the second to be held since that time. Plans have been perfected for a total of four gatherings during the winter, the first to be held at Nazareth in November, and following, two at Bethlehem and one at Easton.

WELL-KNOWN SPEAKERS ADDRESS MASSACHUSETTS DEALERS.

The Massachusetts State Association of Electrical Contractors and Dealers held a special meeting recently at the Employes building of the Edison Electric Illuminating Co. of Boston. The afternoon was devoted to a baseball game between the contractors and jobbers. A brief business meeting was held later, when the reports of the secretary and treasurer were read and accepted. In the evening about 300 attended a banquet, which was followed with addresses by James R. Strong, chairman of the National Association of Electrical Contractors and Dealers; E. W. Miner, president, Contract Purchase Corp. of New York; J. W. Cowles, engineer, Edison Electric Illuminating Co. of Boston; Samuel Adams Chase, Westinghouse Electric & Manufacturing Co., and William L. Goodwin, Society for Electrical Development.

ELECTRICAL INSPECTORS POSTPONE REGULAR MEETING.

The following announcement has been sent out by Washington Devereux, 400 Bullitt building, Philadelphia, president of the National Association of Electrical Inspectors:

"The National Association of Electrical Inspectors will not hold a meeting this year, due to the serious illness of its executive secretary, Thomas Henry Day, 59 Deerfield avenue, Hartford, Conn. Mr. Day had hoped to celebrate his 45th anniversary in the electrical field at this meeting. He began his career Oct. 10, 1876, his first task being in the filled bunkers of the battleship *Tennessee,* installing a thermostatic fire alarm. It is the earnest wish of the members of the Association that Mr. Day may experience a speedy return to health so that he may be able to participate in a banner meeting next year."

ELECTRICAL BUSINESS IMPROVES AT PHILADELPHIA.

Electrical supply companies at Philadelphia report a decided improvement in business in this district, and a number of concerns are showing increased sales over previous months of the year. One supply house reports September as the banner period of 1921. The improvement is attributed to the marked growth in construction operations, covering primarily apartment houses and dwellings, and the reduced prices now prevailing for electrical goods. Wire, metal staples, fixtures and other equipment used in house wiring work are among the items now selling at lower levels. Single-braid, rubber-covered wire, No. 14, is quoted at $6.20 per 1000 ft., in 5000-ft. quantities, locally, as against $11 in October of a year ago, and $6.75 last May. Iron conduit for wiring has declined about 30% in the last month. The call for switch boxes as used for residence wiring work is said to be good at the present time.

MISSOURI FARM LIGHTING PLANT DATA.

The Missouri Co-operative Crop Reporting Service, Jefferson City, Mo., has issued a preliminary statement showing that 20,523 farms in the state have modern lighting facilities. There is a total of 8006 isolated electric lighting plants, individually owned, installed on different farms, while 3133 farms secure electric service from central stations and other outside sources; 9384 farms are equipped with acetylene lighting plants.

A. S. C. E. SECTION TO MEET.

The fall meeting of the Texas section of the American Society of Civil Engineers will be held in Dallas, Tex., Oct. 28-29. A number of interesting papers are scheduled for this meeting. The Technical Club of Dallas will entertain the members and ladies during the meeting.

The American Chamber of Commerce in Spain intends to edit in the early part of December a special number of its monthly bulletin. Full particulars may be had from the Chamber by addressing it at Rambla de los Estudios 8, Barcelona, Spain, or from Eugene L. Perea, care of Boera Brothers, Ferry Terminal building, Staten Island, N. Y.

COMING CONVENTIONS.

Southeastern Geographic Division of the National Electric Light Association. Annual convention, Chattanooga, Tenn., Oct. 17-19. Headquarters, Signal Mountain Inn. Secretary, Charles A. Collier, Electric and Gas building, Atlanta, Ga.

Electrical Supply Jobbers' Association. Quarterly meeting of Atlantic Division, Bellevue-Stratford hotel, Philadelphia, Oct. 20.

Public Utilities Association of West Virginia. Annual convention, Charleston, W. Va., Oct. 20-21. Secretary, A. Bliss McCrum, 514 Charleston National Bank building, Charleston, W. Va.

Telephone Pioneers of America. Tenth anniversary celebration and annual meeting, St. Louis, Oct. 24-25. Headquarters, Hotel Statler. Secretary, R. H. Starrett, 195 Broadway, New York City.

Electrical Exposition, Auditorium, Milwaukee, Oct. 25-31, under auspices of the Milwaukee Chapter of the Wisconsin State Association of Electrical Contractors and Dealers, in connection with the Third Annual Food and Household Exposition, directed by the Milwaukee Journal.

Texas Section of the American Society of Civil Engineers. Fall meeting, Dallas, Tex., Oct. 28-29. Secretary, E. N. Noyes, 1107 Dallas County Bank building, Dallas, Tex.

American Institute of Chemical Engineers. Fourteenth annual meeting, Baltimore, Dec. 6-9. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland.

COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

NEW COURSE OFFERED BY CENTRAL STATION INSTITUTE.

The Central Station Institute is offering its latest in current education—a course of 15 lessons guaranteed to teach a novice how to sell electrical advertising, according to a recent issue of the *Edison Round Table Weekly*. This, of course, centers around the electric sign, the most potent, though economical means of increasing a merchant's business. The course will be augmented by addresses by prominent lecturers on selling, advertising and kindred subjects.

THE SERVICE DIVISION'S PART IN UTILITY'S OPERATIONS.

Work Performed by Installation, Operating and Trouble Sections of Distribution Department of Central Station Company Outlined.

By J. W. JOHNSON,
Superintendent, Service Division, Duquesne Light Co., Pittsburgh.

The service division of the distribution department is divided into three parts, or sections, viz., the installation section, the operating section and the trouble section. Each section is under the supervision of a chief who is directly responsible to the superintendent for the efficient operation of his section. The employes in this division dealing for the most part with the consumer, in person or by telephone, are trained in tact, willingness and cheerful courtesy which, in a large measure, is responsible for the high place attained in the affections of the consuming public.

The installation section, in charge of a chief fieldman, has direct control of all new connections to the company's lines. The fieldmen in this section must be thoroughly conversant with all wiring codes and regulations in force regarding service entrances, entrance boxes and customers' machines and appliances. He must be an amateur draftsman, each connection requiring its individual sketch; he must be able to compute the customer's peak load to recommend the proper size of meter; in short, the fieldman of today must be on his toes all the time.

The operating section is in charge of all meter transfers, disconnects, reconnects and the execution of nonpayment orders. Metermen of this section cover the entire Pittsburgh district. Complete files of consumers are kept authentic and up-to-date by a force of clerks.

The trouble section, from which the division takes its name, working directly under the superintendent, is in charge of all service interruptions arising from any cause and is responsible for their re-establishment. All complaints are received by telephone by dispatchers on the trouble board and are dispatched to the proper troubleman, department or division for attention. After a complaint has been investigated and the trouble repaired a detailed report is entered on the complaint form, which is then held for future reference.

The dispatchers work alternating 8-hr. shifts, changing each week from 8 a. m. to 4 p. m., and from 4 p. m. to 12 p. m. From 8 a . m. to midnight two dispatchers are on the trouble board, while but one works from midnight to 8 a. m. An elaborate system of reports and records is compiled each day under the supervision of the chief dispatcher. These are kept at hand for several years.

The dispatchers, chosen from various departments and districts of the company, are specially trained to their duties. They must be sure and swift in their judgment; must be able to remember things to which the average observer would attach little or no importance; they must at all times be tactful and courteous with the customer; they must be firm believers in the maxim that "A soft answer turneth away wrath" when dealing with an irate housewife in the midst of a washing, or an indignant manufacturer with idle men on his hands from lack of power.

In cases of high tension or station trouble the trouble section works with the system operator, and generally renders valuable aid in the re-establishment of service.

The troublemen in this section are especially picked men of broad experience who can be depended upon to care for any emergency. Nearly all are first-class linemen and are familiar with the company's standards in overhead construction. Besides this, they must also understand inside light and power wiring, meter connections, common faults in customer's machinery or appliances; must be able to make their own tests on lines, transformers and secondary circuits; they must be capable of doing switching on lines of any voltage and must be familiar enough with underground circuits to work in the downtown district in an emergency. Besides all these qualifications the company's troublemen have earned for themselves an enviable reputation for cheerful courtesy and efficient co-operation in dealing with the consuming public.

PLAN ADVERTISING AND FEATURE WRITING CONTEST.

Students in the University of Oklahoma will again be given opportunities to compete for prizes in advertising and feature writing contests sometime during this semester, according to an announcement made to journalism classes at the university recently. The prizes are offered by the Oklahoma Gas & Electric Co., of Oklahoma City, and in view of the success of the plan last year the contest will be made an annual affair under the supervision of the faculty of the school

of journalism. As an annual institution, the scope will be broadened.

Two complete contests in each series will be conducted and a prize of $5 will be awarded the winner of each individual contest. Entries are not to be confined to students of journalism, but are to be open to all students in the university. At the end of the contest a grand prize of $50 will be awarded the students winning the highest number of points in each of the two divisions of the contests, judges to be selected by J. F. Owens of Oklahoma City, general manager of the Oklahoma Gas & Electric Co. Much interest was shown in the contests last year by public service corporations and individuals and organizations engaged in advertising.

OHIO UTILITY OFFERS ITS STOCK TO CUSTOMERS.

The Pennsylvania-Ohio Power & Light Co., Youngstown, O., a subsidiary of the Republic Railway & Light Co., is offering its 8% preferred stock to its customers. It is reported that employes have already subscribed for $196,600 of the issue. G. T. Seely, vice-president and general manager, states that the proceeds will be used to make extensions and improvements, and is of the opinion that there is a sufficient supply of local money to assure the placing of the entire issue at home.

EDUCATING CUSTOMERS TO PROPER USE OF ELECTRIC SERVICE.

Methods Employed by Public Service Department of Southern Utility in Handling Complaints Filed by Customers.

By H. G. Pruett,
Chattanooga (Tenn.) Railway & Light Co.

Applications for electric service or the discontinuance of the same, the adjusting of bills for service and customers' complaints are all handled through the Public Service Department, which was organized as a separate adjunct of the Treasury Department in the latter part of 1919.

During the year 1920 the number of complaints filed approximated 2000, and based on figures for the past 7 mo., 1921 will show a total of 1200. The decrease is due largely to the fact that customers are being educated in the proper use of electric service and in the reading of their meters. Complaints may be apportioned as follows: 80% due to the amount of bills rendered; 10% due to erroneous meter readings; 5% due to meters creeping, and 5% miscellaneous.

It has been our experience that of the total number of complaints filed 5% are the result of errors committed by the company. Requests for meter tests were formerly very frequent. During 1920 anywhere from 30 to 40 meters were tested monthly, whereas the number has now dwindled down to but two or three. This is due to the fact that meters have been found to register accurately upon test. If a meter does get out of adjustment in 99 cases out of 100 the meter will run slow—which is to the customer's advantage.

Complaints on meter readings are filed at 620 Market street with the Public Service Department and are immediately forwarded to the Meter Department. A man qualified to make the investigation is sent to the address of the complainant and not only inspects the meter, but takes cognizance of general conditions such as wiring, sizes and types of lamps and character of appliances in use. This information is transmitted back to the complaint desk and is compared with the customer's ledger account. If an error is found, or if there is no reason for adjustment in view of the existing facts, the customer is promptly notified by letter. During the settlement of a complaint the customer is generally shown how to read his meter and how to compute his bill over a period of 30 days. He is also advised to read the meter often during the month in order that he may know at just what time his energy consumption is at a maximum.

Investigations of complaints reveal many things —improper lighting facilities as compared with interior decorations, two 25-watt lamps in indirect lighting units, 220-volt lamps on 110-volt circuits, five 100-watt lamps in 9 by 12 rooms, or one 500-watt lamp in a 12 by 14 reading room, amateur electricians, and other and numerous mistakes. Some customers make it a point to get our advice on what type of lamps is most suitable and economical for their particular use, while others rely too much on their own judgment when proper advice may be had for the asking. The result of ignoring proper advice is often unsatisfactory or uneconomical lighting.

Recently an investigation of a residence lighting bill that had "jumped" from $2 to $4 disclosed the fact that a 75-watt lamp had been left burning in a basement room used for storage purposes for several days by the maid who had gone there to pile up some furniture. After finishing the work she had locked the door and left the light burning.

Every effort is made to assemble all of the facts in each complaint filed in order that an equitable adjustment may be made. All light and power customers who experience dissatisfaction over any phase of the service rendered them should feel at perfect liberty to communicate with the Public Service Department at any time with a view to amicable settlement.

PERPETUAL MOTION IN CUSTOMER OWNERSHIP.

Chet Barber, editor of *Sparks and Flashes,* the employes' house organ of the Enid (Okla.) division of the Oklahoma Gas & Electric Co., says: "Perpetual motion is very well illustrated by a number of stockholders in the Oklahoma Gas & Electric Co., who, upon receipt of their divided checks, turn them back to the company to apply on more stock. The habit of investing in securities of utility companies, once acquired, seems to grip people with the saving habit."

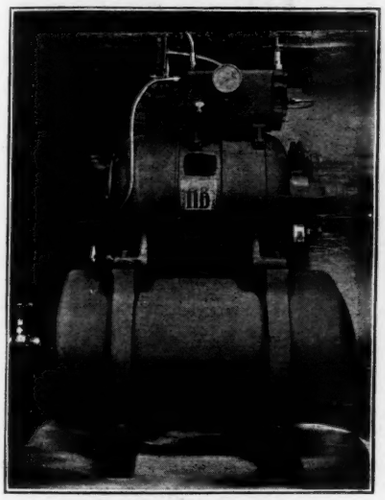
The first prize in the August contest of the Oklahoma Gas & Electric Co. for the best suggestions received from employes was won by Robert B. Ford, of the auditing department, with a suggestion concerning office forms. Second and third prizes were won by B. H. Pooler and Will Dixon, respectively.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

Air Compressor With Magnetic Pressure Release.

A new automatic air compressor pump, compactly mounted on its air tank, has been placed on the market by the Hobart Brothers Co., Troy, O., manufacturer of "HB" battery charging equipment, electric motors and lighting generators.



New "HB" Automatic Air Compressor.

The manufacturer states that the device will maintain a constant air pressure at all times, day and night, on air lines without attention, once the outfit is properly installed. The main features of the device are thus set forth by the maker:

The outfit is compact yet of ample capacity for service station use. The latest exclusive "HB" feature is the magnetic pressure release which enables the motor to start without load, thus saving current and guaranteeing an instantaneous start. It is gearless, ball bearing, automatic and unusually quiet. The low-speed ball-bearing compressor type of motor is built directly in the pump, the motor shaft being part of the pump shaft, making the motor and pump one compact unit. The air and oil filter, safety valve gage and tank are all standard equipment with this outfit. It can be operated from lighting or power lines. The unusual compact size of this device makes it desirable for oil service stations where space is limited, it is stated.

Light Weight Engine Generator Sets for Use on Shipboard.

There has been placed upon the market recently a Westinghouse-Sturtevant marine lighting set which is especially adapted for lighting and power on shipboard. These outfits are recommended by the manufacturer for reliability, light weight, compactness and economy of operation. Both the engine and generator making up these sets embody the results of considerable engineering and manufacturing experience. Automatic lubrication, elimination of vibration, low piston speed, sparkless commutation, and good voltage regulation are features of the design. The frame is made oil and dust proof and is provided with large openings having cast iron covers in such a position as to give ready access to all parts subject to wear. In the top of the frame is cast an oil reservoir for the lubricating system.

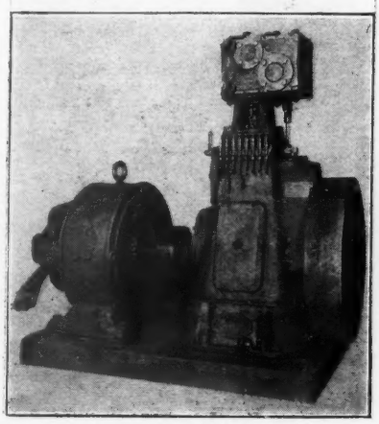
An ample distance piece separates the cylinder and frame in which are inclosed a watershed partition and stuffing box, together with the piston-rod stuffing box. The watershed partition prevents the water from the cylinder leaking into the frame and the oil in the frame from being carried into the cylinder.

The cylinder is of close grained iron of a special mixture insuring homogeneous castings, and is cast in one piece with the valve chest. Both are thoroughly insulated with non-heat-conducting material and covered with a lagging of planished steel. The cylinder is equipped with relief valves of large diameter which may be adjusted to open at any desired pressure. These guard against damage due to water coming over with the steam. The valve is of the piston type and operates in a renewable bushing which forms the valve ports. The valve is connected by means of the valve stem, slide eccentric, rod and eccentric strap to the eccentric attached directly to the governor. All pins and rods are of open hearth steel and the bearing pins are hardened and ground.

The engine is equipped with an inertia governor of the Rites type. This governor is placed in a heavy fiywheel and is capable of close regulation, keeping the variation between no load and full load as low as 1.5%. The piston is of cast iron, cored for lightness and fitted with cast iron snap packing rings, turned to perfect contact. It is pressed to a taper fit on the piston rod and is further secured by a nut pinned to the rod. Both the connecting rod and the piston rod are of open hearth forged steel, each in a single forging. The crank-pin end of the connecting rod is provided with malleable iron, marine type boxes, and the cross-head end is fitted with brass boxes of the same design. The crank shaft is of open hearth steel made in a single forging, and is machined all over and carefully fitted with balancing counter weights secured to the webs.

The lubricating system is automatic, continuous and self contained, requiring no independent tank or reservoir. In engines having gravity-type lubrication the oil is pumped from the reservoir in the base by a chain-driven rotary pump entirely submerged in the oil to the upper reservoir cast in the top of the frame. From here it flows by gravity through brass pipes to the various bearing surfaces requiring oil, then back to the reservoir in the base where it is strained and pumped again. Where a forced-feed system of lubrication is furnished the submerged pump forces the oil under pressure through brass pipes direct to all parts requiring lubrication. The oil then drains back to the base where it is strained and again forced through the system. An oil-well level gauge is supplied attached to the outside of the base.

With every engine there is regularly furnished an automatic hydrostatic-type lubricator, a set of wrenches, and



Westinghouse-Sturtevant Marine-Type Lighting Set.

anchor bolts with plates when required. The type "SK" generators, made by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., forming part of these sets have all the features that have made the "SK" line of motors and generators so successful in general utility service and in numerous special applications. In addition the generator is especially constructed to meet the requirements of marine service. The frame is forged from open hearth steel, eliminating the possibility of blowholes and resulting in a light compact and strong construction. The bearing on the generator is a babbitt-lined solid steel shell, so constructed that no leakage of oil will occur with listing of the ship.

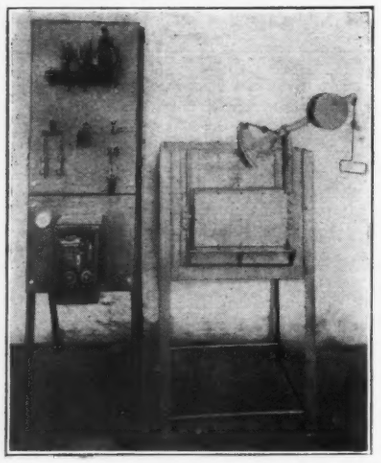
All armature coils are so constructed that no cross overs on edge occur, thus eliminating a prominent cause of armature-insulation breakdown. Both armature and field windings are impregnated with a special compound for resisting the moisture and salt atmosphere found in marine service. One of the fundamental ideas of the design is the open and well-ventilated construction. Air can circulate freely through the generator, coming in contact with all internal parts and thus eliminating the possibility of internal hot spots.

Sparkless commutation results from the application of commutating poles, and consequently the wear on the commutator and brushes is reduced to a minimum. This is especially so since the speed of these sets is relatively low. The brush position is fixed before the set leaves the factory and never requires any adjustment. Noncorrosive material is used for brush holders and all parts which might be affected by moisture.

Small Semi-Cylindrical Heat-Treating Furnace.

To overcome the objections that have been made to the small electric heat-treating furnace, especially as regards time of heating and flexibility of temperature control, the General Electric Co., Schenectady, N. Y., has recently developed a new type of automatic furnace known as the semi-cylindrical type. This furnace, which possesses many new and improved features in design and construction, is primarily designed for operation at 1800 deg. F., although by removing the temperature-limit fuse it can be safely operated at 2000 deg. F.

A complete equipment consists of the furnace, transformer, automatic control



Electric Resistance Furnace and Its Control Equipment.

panel and a temperature-control instrument which is mounted on the sub-base of the panel. The furnace consists of a sheet-steel casing supported on legs and lined with insulating material, and having a semi-cylindrical chamber. It is in the design of the heating element that the most radical departure from former types has taken place, eliminating troubles experienced in many small types of furnaces.

The heating element consists of a continuous strip of resistor ribbon formed into an arch or succession of semi-circular turns conforming to the arch of the furnace chamber and extending the whole length of the latter, the proper spacing between turns being maintained by means of insulators. This gives a strong winding which is self-supporting and still flexible to expansion and contraction. The two ends of the winding are brought out at the back wall of the chamber so that the cables of the power supply may be attached. This not only gives a heating element that is very strong mechanically, but one that gives excellent heating characteristics to the furnace. The heat is radiated direct to the charge and the absence of a muffle allows a lower temperature gradient as no heat has to be forced through it to reach the charge. Also, since the resistor is of large cross section, the combination of the two factors allows a high power input for the heating-up period with no danger of a burnout.

It is said that the heat distribution of the furnace is excellent, owing to the spacing of the resistor ribbon which tends to give uniform temperature from front to back in the chamber. It is also possible to obtain rapid changes of temperature over the range from 1000 to 2000 deg. F. Another feature is that the whole heating unit may be pulled out bodily for inspection or repair by simply removing the front of the furnace and disconnecting the terminals at the back.

The transformer, which is mounted on the pipe frame of the control board, has four primary coils which are insulated from the secondary. The coils may be connected in multiple, multiple-series or series for 110, 220 or 440 volts, respectively, at 60 cycles. The secondary has two taps; one a 70-volt tap giving 10-kw. capacity for rapid heating, and the other a 50-volt tap giving 5-kw. capacity for normal operation. A small-capacity extension to the secondary is also provided, which supplies 110 volts to the contactor coil and for the motor of the temperature control instrument. The transformer is rated at 7.5 kw., normal, but will give 10 kw. for short periods such as mentioned above or for 1 or 2-hr. periods during the day when it is desired to change the temperature quickly.

The control panel carries the furnace contactor, line switch and a double throw switch which in its upper position puts the furnace on the 70-volt tap of the transformer secondary, and in the lower position on the 50-volt tap. The lower position is for normal operation. The temperature control instrument on the lower half of the panel has a scale range of 1000-2000 deg. F. so that the furnace is protected from being set at too high a temperature. If for any reason the instrument should fail, or become inoperative, further protection is provided by a special fuse which melts at a temperature a little above 1800 deg. F., opening the main line contactor when it melts and disconnecting the furnace from the power supply. The time required for heating is 1.5 hrs. from cool to 1560 deg. F. when the furnace has been run the previous day, and 2 hrs. when the furnace is cold.

Advantages of Using "Rustsolvo" on Machinery Parts.

Every mechanic knows how exasperating it is when metal parts become cemented together through rust action. It is not unusual that valuable parts must be destroyed by hammer and cold chisel in dismantling machinery because of this condition.

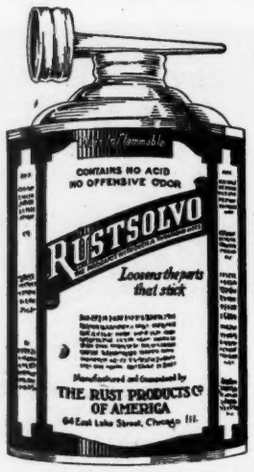
After a number of years of research and experimenting to find a solution to the problem of cutting rust and thus releasing parts, particularly bolts and nuts, and screw joints on pipe which have been securely cemented together through oxidation, carbon, red or white lead, or are heat bound, W. P. McKinney, of Chicago, compounded a liquid which he has placed on the market under the trade name of Rustsolvo.

Wherever metal enters into the construction of a mechanism, machine or structure that must from time to time be dismantled or repaired, Rustsolvo can be used with great advantage by reason of the time and material saved in making it possible to unscrew threaded parts and successfully remove them rather than destroy them as is the practice now when found to be inseparable due to rust, carbon, red or white lead, heat bound, etc.

Rustsolvo is not new and untried. For several years past, Mr. McKinney has demonstrated its effectiveness in some 30 distinct fields of business activity. Moisture, and particularly the salt-laden atmosphere of the coasts, is constantly at work in oxidizing (rusting) metals wherever they are used. In every one of these fields Rustsolvo has done all that has been claimed for it.

Thousands of testimonials, many of them from the largest industrial concerns in the country, prove beyond question the effectiveness of this liquid, a few drops of which placed upon a rusted part, nut or bolt, will loosen it quickly from what has heretofore seemed a grip that required complete destruction of the part for removal.

Any mechanic that has had to do with the repair of machinery can testify to the innumerable cases of rust-cemented bolts and other parts that have required



"Rustsolvo" Is Sold in This Handy Can.

hours of time to remove, to say nothing about the value of parts destroyed in an unsuccessful effort to remove them.

Rustsolvo acts quickly. Many times but a few seconds are necessary to break down or dissolve the rust and loosen parts, bolts, nuts, pipe-fittings, etc. It is a liquid which should be available in every machine shop, garage, shipyard, railroad or other repair shop, on the farm and in the household. It is inexpensive and harmless except to rust, which it immediately destroys without injury to metal.

Rustsolvo is manufactured by the Rust Products Co., 64 East Lake street, Chicago, of which Mr. McKinney is president and manager, and is sold in cans containing 1 gal., ½ gal., 1 qt., 1 pt. and ½ pt.

The Rust Products Co. is anxious to hear from mechanics or ex-service men out of employment to whom they are ready to make a most interesting proposition that will enable them to earn a good living at the start and which can be developed into a life-long business.

Direct Separator Co., Inc., Syracuse, N. Y., has issued Catalog No. S21. As an introduction to descriptions and illustrations of the apparatus manufactured by this company, a short historical sketch is given, followed by a presentation of the problems "Water in Steam," and "Separating Water from Steam." In addition to descriptions and illustrations of the various types of separators, the catalog contains tables of dimensions for both oil and steam separators and reports of tests proving their efficiency.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Gainaday Electric Co., Boston, has leased property at 140 Boylston street for a new local establishment.

The Aluminum Co. of America, Oliver building, Pittsburgh, manufacturer of electric wires and cables, etc., has arranged for a bond issue of $18,000,000, for general operations and extensions.

Philadelphia Electrical & Manufacturing Co., 1206-1220 North 30th street, Philadelphia, has acquired the 1-story building adjoining the rear at 1222-28 North 31st street, for extensions.

American District Steam Co., North Tonawanda, N. Y., manufacturer of expansion devices, insulating materials, etc., for central station heating systems, has issued catalog No. 21 covering its product.

Philadelphia Steam Heating Co., Juniper and Cherry streets, Philadelphia, has acquired the 3-story building at 3318 Lancaster avenue, and will use the site for proposed plant extensions in that section.

Western New York & Pennsylvania Traction Co., Bradford, Pa., has made application to the Public Service Commission for permission to reorganize under the name of the Bradford Electric Railway Co.

Southern Bell Telephone & Telegraph Co., Atlanta, Ga., plans to install cables at Ensley, Ala., to provide that city with 1000 additional telephones. The company will expend $3,000,000 in the state within the next 5 yrs.

Western Union Telegraph Co., Philadelphia, is having plans prepared for the erection of its proposed building on property recently acquired on Locust street, near 15th street. It is expected to call for bids at an early date.

W. S. Rockwell Co., 50 Church street, New York City, has issued bulletin No. 232 bearing the title "The Variety of Furnace Design," which contains diagrammatic drawings of different types of furnaces for industrial heating.

Racine Electric Co., Racine, Wis., has recently added equipment which will enable it to make its own dies and patterns, and thus place the company in a favorable position to bid on and manufacture special motors and motor attachments.

National Illuminating Appliance Co., 255 West 44th street, New York City, manufacturer of Henri Raphael Cook's "Raphael" art lamps, lighting fixtures and special illuminating products, calls attention to a slight discrepancy which appeared in the item on p. 413 of the September issue of ELECTRICAL REVIEW. It was stated that the company was "formed to manufacture art lamps, lighting fixtures and special illuminating products under Henri Raphael Cook's process of making glassware." The company advises that the process mentioned gives the effect of art glass, the lamp shades being made of fabric so finished by the Henry Raphael Cook process as to resemble glassware.

William S. Turner & Co., Spalding building, Portland, Ore., is now sales agent for the manufacturers of Sanford Riley automatic stokers, De Laval steam turbines and pumps, Wheeler condensers, Heine water-tube boilers and the Leffel water-wheels.

General Electric Co., Schenectady, N. Y., has issued bulletin 46041, descriptive of its type H2 alternating-current temperature indicator for transformer windings, the purpose of which is to safeguard transformer units from deterioration due to overheating.

American Bosch Magneto Corp., Springfield, Mass., has recently completed the erection of its 10-story building at 17-19-21-23 West 60th street, New York City. The corporation will occupy four floors for its automotive electrical sales and service station.

National Lamp Works of General Electric Co., Nela Park, Cleveland, is planning the early occupancy of its new local plant on East Ferry street, Buffalo, N. Y., now nearing completion. The factory will be 3-story and basement, 80 by 320 ft., and will represent an investment of about $750,000.

Standard Underground Cable Co., Westinghouse building, Pittsburgh, has awarded a contract to the American Bridge Co., Pittsburgh, for about 550 tons of structural steel to be used for the erection of its proposed local plant on Kingshighway, St. Louis, to be 300 by 520 ft., and estimated to cost $1,000,000, including machinery.

Electric Construction Co., Rock Island, Ill., has been reorganized with J. J. Murphy as president; R. C. Vance, secretary, and W. R. Kale, treasurer. Mr. Vance was formerly owner of the Blackhawk Electric Co. of Rock Island, and Mr. Murphy has been superintendent and engineer of the Electric Construction Co. for the past 14 yrs.

American Steel & Wire Co. has abolished its New England sales district, which for years has had its headquarters at Worcester for the handling in the New England territory of the specialties made in the district. Hereafter all sales in the district, with the exception of Worcester and Boston and the Metropolitan district, will be handled from the New York sales office. A. F. Walters will continue as the head of the Boston office, in charge of that district. Albert M. Webb, who has been sales agent in charge of springs and other specialties for the New England district, will be the head of the Worcester office. Transferred from Worcester to the New York office are C. W. Whiting of the flat wire department, Otto Sharp of the rope department, and F. K. Sawyer of the spring department.

Driver-Harris Co., Middlesex street, Harrison, N. J., manufacturer of electric resistance wires, etc., has completed plans for the erection of a 1-story plant addition, 95 by 275 ft., estimated to cost $30,000. Construction will be commenced at once.

Delco Light Co. distributors held a 2-days' sales conference at the Chamber of Commerce rooms in Cedar Rapids, Iowa, recently. The fundamental idea of the campaign is to acquaint the people of the rural districts with the use and benefits of electric light.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued leaflet 1888-A, describing the applications of storage-battery mine locomotives, and illustrating the Baldwin-Westinghouse type of apparatus. Leaflet 1610-C describes in detail the features of type A auto-starters, including the auto-transformer, switching mechanism, contacts, overload relays, etc.

Allis-Chalmers Manufacturing Co., Milwaukee, has issued a new publication known as No. 1640-A and entitled "A New Type of Hydraulic-Turbine Runner for Low-Head Developments." This is a reprint of the article read by Forrest Nagler on the so-called Nagler runner before the American Society of Mechanical Engineers several years ago, also other articles and matter relating to this type of runner.

American Insulated Wire & Cable Co., 21st, Sangamon and Morgan streets, Chicago, manufacturer of the "American Brand" weatherproof wire and cables, bare copper wire and cables, etc., has announced that it has just issued its "American Brand" leather-bound vest pocket catalog, which is stated to be one of the most complete encyclopedias on weatherproof wire and cables, weatherproof iron wire and bare copper wire and cables ever published for the electrical industry.

Stromberg Electric Co., 209 West Jackson boulevard, Chicago, manufacturer of time recording systems, has issued bulletin No. 214 illustrating and describing its process timing and signalling instruments. It is stated that this instrument has been developed to meet the demand for an accurate and thoroughly dependable means of automatically operating a signal at the end of a predetermined time, to announce the completion of a process or operation, and has a broad field of application.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

CHARLES P. MCCHORD of Kentucky has been elected chairman of the Interstate Commerce Commission for a term ending Dec. 21, 1922.

C. A. MALONE, formerly with the California-Oregon Power Co., has become assistant superintendent of the Hawaiian Electric Co., Ltd., Honolulu, Hawaii.

F. D. WEBER, electrical engineer, Portland, Ore., vice-president of the Oregon Board of Engineering Examiners, attended the Council of State Boards of Engineering Examiners at St. Louis, Oct. 3.

T. G. KELLY, superintendent of the transportation and claims department of the Fort Smith (Ark.) Light & Traction Co., has recently been admitted to the bar in Arkansas. He has been with the Fort Smith company for 10 yrs.

E. R. JOHNSON, who has had extensive experience with synchronous motors, has been appointed in charge of synchronous motor sales for the Ideal Electric & Manufacturing Co. of Mansfield, O. Mr. Johnson will be located in Mansfield and will travel from that office.

FREDERICK A. SCHEFFLER, manager of the power department, Fuller Engineering Co., 50 Church street, New York City, entertained several engineers and Edison Pioneers at the Engineers' Country Club, Long Island, N. Y., Oct. 6. The day was spent in the invigorating game of golf, and among those who took part were Dr. E. G. Acheson, president of the Acheson Corp., New York City; A. R. Bush, General Electric Co., Schenectady, N. Y.; John W. Howell, General Electric Co., Harrison, N. J., and Theodore Beran, New York district manager of the General Electric Co.

WILLIAM S. MURRAY, who was formerly chairman of the Superpower Survey, has recently opened an engineering office in the Grand Central Terminal, New York City, in partnership with Henry Flood, Jr. After graduation from Lehigh University in 1895 with the degree of electrical engineer, he became an apprentice at the East Pittsburgh (Pa.) plant of the Westinghouse Electric & Manufacturing Co. and during the following 7 yrs. successively filled the positions of testing room engineer, construction engineer on the road, district engineer of New England and finally sales engineer. In his construction work he was connected with the installation of the first high-tension plants in the state of Maine. From 1902 to 1905 Mr. Murray practiced consulting electrical engineering in Boston and then secured the position of electrical engineer with the New York, New Haven & Hartford Railroad Co. Later he became the consulting engineer in the electrification of the New York division of this railroad, which was completed in 1915 at a cost of $25,000,000. In 1913 he formed a partnership with E. H. McHenry, former vice-president of the New York, New Haven & Hartford Railroad Co., and during this association completed the New Haven electrification. During Mr. Murray's presidency of the Housatonic Power Co., which owned power developments on the Connecticut portion of the Housatonic river, the company was purchased by the Connecticut

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William S. Murray.

Power Co., and he became chief engineer of the latter company. The recently completed hydroelectric station on the Housatonic known as "Stevenson" is a part of a chain of developments undertaken by this company, which when in operation, will make Connecticut's contribution to conservation a saving of 500,000 tons of coal annually. Mr. Murray is now the senior member of the firm of Murray & Flood, engineers, Grand Central Terminal, New York City. He is a member of the American Institute of Electrical Engineers.

E. C. WELBORN has announced the opening of offices at suite 1032, 29 South La Salle street, Chicago, as business and engineering counsel. He offers his services to banking houses, industrial organizations, attorneys and individuals in the solution of financial, business and engineering problems, and will make investigations, analyses and reports. He will develop new products for established industries and new applications for established products. Mr. Welborn graduated in the mechanical engineering course of Cornell University in 1903, and became connected with the Illinois Steel Co., Chicago, in 1903-1904, in structural shop work and engineering. From 1904 to 1912 he was with the Allis-Chalmers Manufacturing Co., Milwaukee, being engaged in engineering, steam turbine, power plant and sales work for 3 yrs., and from 1907-1912 he was assistant treasurer of the company in charge of credits, collections, contract examinations, etc. During the next 2 yrs. he was secretary of the Standard Separator Co., Milwaukee, in charge of engineering, manufacturing, credits and collections, and from 1914-1919 he was connected with the Illinois Steel Co., Chicago, as assistant manager of credits and collections. From 1919-1921 he was vice-president of the Hanna Engineering Works, Chicago, which position he resigned to go into business for himself.

J. M. WAUCHOPE has been appointed superintendent of the Walla Walla river plant of the Pacific Power & Light Co. at Milton, Ore.

MORTIMER E. COOLEY, dean of the Colleges of Engineering and Architecture of the University of Michigan, Ann Arbor, Mich., has been elected president of the American Engineering Council of the Federated American Engineering Societies, to succeed Herbert C. Hoover.

WILLIAM MCCLELLAN, of Philadelphia, president of the American Institute of Electrical Engineers, has recently been appointed a member of the Pennsylvania State Board of Licensing Engineers by Governor Sproul, under the law passed at the last session of the Pennsylvania Legislature.

E. C. RICHARDSON, who was recently appointed general manager of the China Electric Co. at Peking, to succeed C. H. Minor, who has returned to the European organization of the International Western Electric Co., has almost circled the globe since he started as a clerk at Chicago 16 yrs. ago. Mr. Richardson went to Antwerp as an auditor and accountant in 1907 and had risen to the chief clerkship before the end of 2 yrs. In 1910 he became manager of the Western Electric Compania Italiana at Rome, and 4 yrs. later he transferred his headquarters to Milan.

OBITUARY.

W. D. KOHLWEY died recently at his home in San Francisco. He was connected with the Kohlwey-Smith Electrical Co., contractor-dealer of San Francisco, and was a member of the Electrical Development League of that city.

JAMES A. WALTON, of the electrical engineering department, Edison Electric Illuminating Co. of Boston, died recently, aged 36 yrs. He was born in Cambridge, Mass., and took the electrical course at Lowell Institute. He was assistant in the electrical laboratory at the Massachusetts Institute of Technology and later went with the Consolidated Gas, Electric Light & Power Co. of Baltimore and finally with the Edison Electric Illuminating Co. of Boston in the engineering department. Mr. Walton joined the American Institute of Electrical Engineers in 1909 and was transferred to the grade of member in 1913.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Augusta, Me.—Central Maine Power Co. is disposing of a bond issue of $3,000,000, the proceeds to be used for general financing, operations, extensions and improvements.

Augusta, Me.—Midwest Power Co. has been incorporated with a capital of $1,000,000, to operate an electric power plant in this section for local commercial service. D. A. Leland is president; and H. L. Cochrane, treasurer, both of Augusta.

Boston, Mass.—Edison Electric Illuminating Co. has made application to the Department of Public Utilities for permission to issue 45,056 additional shares of stock, at a price to be determined by the board of directors, the proceeds to be used for general operations, extensions, etc.

Boston, Mass.—Boston Wharf Co. has filed plans for extensions and improvements in the power house at its works on Summer street.

Charlestown, Mass.—Charlestown Gas & Electric Co. has filed plans for extensions and improvements in its plant on Arlington street.

Haverhill, Mass.—Haverhill Gas Light Co., operated by Stone & Webster, Boston, is arranging for a stock issue of $146,250, the proceeds to be used for current indebtedness, operations, extensions, etc.

Malden, Mass.—Malden Electric Light Co. has notified the Department of Public Utilities of intention to reduce the rate for general lighting service from $0.11 to $0.085 per kw-hr.

Millbury, Mass.—In connection with its new local plant, construction of which has just been commenced, the Richard French Iron Works, Muskego street, Worcester, Mass., has contracted for the use of central station power. The machinery to be installed will be electrically operated. The main building will be one-story, 65 by 120 ft. A. B. Campbell is head.

Ansonia, Conn.—Ansonia Electric Co. has commenced the erection of the superstructure of its proposed new plant addition, to be used for the manufacture of electrical specialties, and plans to occupy the structure at an early date. Various contracts for completion have been awarded. The new factory is estimated to cost in excess of $100,000.

Hartford, Conn.—Electric motors, controlling devices and other equipment will be installed in the printing plant to be erected on Franklin avenue by R. S. Peck & Co., 26 High street.

Albany, N. Y.—Pittsburgh Plate Glass Co., Pittsburgh, will build a power house at its proposed new factory and warehouse on Tivoli street, Albany, N. Y. R. T. Conley, 103 Hunter's Point avenue is architect in charge of the work.

Albany, N. Y.—The Water Power Commission is considering preliminary plans for the construction of a series of hydroelectric power plants along the route of the Barge Canal, with distributing lines to furnish light and power service in the respective districts. The plant capacity is estimated 40,000 hp., divided into different units of about 12,000 hp. each. It is planned to commence construction at an early date.

Brooklyn, N. Y.—Brooklyn Edison Co., 360 Pearl street, has arranged for a new bond issue of $3,000,000, the proceeds to be used for general operations, extensions, etc.

Buffalo, N. Y.—Electric motors and other electrical machinery will be installed in the new candy manufacturing plant to be erected by the Falcon Candy Co., at 970 Sycamore street. The main plant will be approximately 30 by 140 ft. Application for permission to build the structure has been made to the City Council.

Buffalo, N. Y.—A proposition is being considered by the City Council for a referendum at the coming election, for a vote of citizens on the question of the construction and operation of a municipal power plant and distributing system.

Buffalo, N. Y.—A city ordinance is being prepared to require the electrification of all railroad lines entering the city. Commissioner Perkins is at the head of the movement.

Buffalo, N. Y.—The Niagara Gorge Power Co., Ellicott square, has made application to the state Water Power Commission for permission to construct a hydroelectric power plant in the Gorge district of Niagara Falls, and utilize waters for operation. The proposed plant will have an ultimate capacity of 300,000 hp. The company is a subsidiary of the Niagara Gorge Railway Co.

Caroga, N. Y.—Kolaneka Electric Light & Power Co. has been incorporated with a capital of $15,000, to operate a local light and power system. The incorporators are W. J. and C. Vandusen and O. J. O'Neil. The company is represented by J. T. Morrison, Johnstown, N. Y.

New York, N. Y.—New York Edison Co., 15th street and Irving place, has made application to the Public Service Commission for permission to issue bonds in an amount of $30,000,000, the proceeds to be used for general operations, power plant extensions and improvements, etc.

New York, N. Y.—Woodwell & Resler, 501 Fifth avenue, architects and engineers, are completing final plans for the erection of the proposed electric generating plant, to be erected by the City Council, Lansing, Mich., estimated to cost in excess of $1,500,000. Bids will be asked at once. J. A. Parsons is city clerk, Lansing.

Niagara Falls, N. Y.—Niagara Falls Power Co. has made application to the Public Service Commission for permission to build an addition to its electric power plant in the town of Grant Island.

Potsdam, N. Y.—St. Lawrence Transmission Co. has filed application with the Public Service Commission for permission to install and operate an electric-lighting system at Colton, N. Y., where a franchise has been secured.

Utica, N. Y.—The St. Joseph's Infant Home, Sisters of Charity, has had plans prepared for the erection of a power house and mechanical laundry plant on Green street, estimated to cost $45,000. Edward J. Berg, Jones building, is architect.

Camden, N. J.—Electric motors and other electrical equipment will be installed in the new machine shop and manual training department to be established by the Board of Education at the high school on Wildwood avenue. It is estimated to cost $60,000.

Irvington, N. J.—The Town Commission is planning the installation of a new electrically operated police signal system. Leonard Setaro, director of public safety, is in charge.

Newark, N. J.—A 1-story power house will be constructed by the General Leather Co. at its plant on Frelinghuysen avenue. Fred A Phelps, Union building, is architect.

Newton, N. J.—New Jersey Power & Light Co., Dover, has taken over the plant and property of the Newton Electric & Gas Co., for a consideration of $168,000.

Weehawken, N. J.—Considerable electrical equipment will be installed in connection with the proposed new sanitary sewerage system and sewerage disposal plant to be constructed by the North Bergen Township Commissioners, estimated to cost about $2,000,000.

Weehawken, N. J.—Fulton Lumber Terminal Co., 120 West 44th street, New York City, will build a power house and install considerable electrical equipment at its new plant on the Hackensack River, near Weehawken, to occupy a square mile of property. The installation will include loading and unloading machinery, conveying equipment, etc. A cold storage plant will also be established. C. P. Eckles is president.

Wilmington, Del.—Considerable electrical equipment will be installed in the proposed new incinerating plant to be constructed by the City Council, in accordance with recommendations made by John H. Gregory, sanitary expert, recently engaged

to make a survey of the local conditions.

Wilmington, Del.—The Planta Electrica, Inc., has been incorporated under state laws to construct and operate an electric power plant and system in Honduras. The company is represented by the Corporation Service Co., Wilmington.

Allentown, Pa.—Pennsylvania Power & Light Co. is disposing of a bond issue of $8,000,000, the proceeds to be used for general operations, extensions, improvements, etc.

Biglerville, Pa.—Biglerville Electric Co. has been granted permission by the Public Service Commission to effect a merger with the Ortanna Electric Co., operating in this section.

Chester, Pa.—The Public Service Commission has approved the application of the New London Electric Co., and the Penn-Oxford Electric Co., to operate systems in Penn and New London townships for general commercial service.

Coatesville, Pa.—Chester Valley Electric Co. has entered into an agreement with the city officials for furnishing service for street-lighting for a period of 7 yrs. The contract has been approved by the Public Service Commission.

Harrisburg, Pa.—Considerable electrical equipment and power apparatus will be installed by the Water Department in connection with the enlargement of the filtration plant and extensions in pumping station. The work will include a new power house, two 15,000,000-gal. high-lift centrifugal pumps, one low-lift pump of like capacity, eight new filters and auxiliary equipment.

Huntingdon, Pa.—Notice of the formation of a merger company has been filed by the Roaring Spring Light, Heat & Power Co., the Cove Electric Co. and the North Woodbury Electric Co., all of Huntingdon. The merger will be known as the Cove Electric Co. of Huntingdon. The capital stock is $60,000, and W. R. Simpson is treasurer of the new company.

McKees Rocks, Pa.—Considerable electrical equipment will be installed in the ice-manufacturing plant to be erected by the W. L. Singer Ice Co., estimated to cost $60,000.

Philadelphia, Pa.—Considerable electrical equipment will be installed in the new textile mill to be erected by the Oscar Nebel Knitting Mills, 3860 Coral street, at Fifth and Courtland streets, estimated to cost $100,000.

Philadelphia, Pa.—Forrest Laundry Co. has filed plans for the erection of a new power house at its plant, 1704-12 North Fawn street, to cost about $60,000.

Scranton, Pa.—Cumberland Township & Adams Power Co. has been incorporated with a nominal capital of $5000, to install and operate an electric system in Cumberland township, for general light and power service. F. Heinbokel, Scranton, is treasurer.

Wilkes-Barre, Pa. — Pennsylvania Power & Light Co., Allentown, Pa., has acquired the plant and property of the Wilkes-Barre Electric Light Co., and will merge the system with its own lines in this district. The Pennsylvania company is operated by the Electric Bond & Share Co., 71 Broadway, New York City.

Wilkes-Barre, Pa. — Wilkes-Barre Electric Service, Inc., has been incorporated with a nominal capital of $5000, to operate a local electric system. G. R. Davis, Wilkes-Barre, is treasurer.

Annapolis, Md.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded a contract to the David M. Andrews Co., Sisson street, for the erection of an addition to the power plant at the local naval property, and for the installation of an electric lighting system and construction of coal bunker at the naval hospital reservation.

Baltimore, Md.—Considerable electrical equipment will be installed in the dairy plant to be erected on Linden avenue, near Dolphin street, by the Western Maryland Dairy, estimated to cost $500,000 with machinery.

Baltimore, Md.—Consolidated Gas, Electric Light & Power Co., Lexington building, has arranged for a new bond issue of $9,000,000, subject to the approval of the Public Service Commission, the proceeds to be used for general operations, extensions, improvements, etc.

Petersburg, Va.—Virginia Railway & Power Co is completing plans for the construction of a hydroelectric generating plant on the Appomattox river, to cost about $100,000. Construction will be commenced at an early date.

Goldsboro, N. C.—The Common Council is arranging for the operation of a municipal traction system. The local lines have been acquired by the municipality, heretofore operated under private ownership, and extensions will be made.

Hendersonville, N. C.—The Common Council is considering the granting of a 50-yr. light and power franchise to the Blue Ridge Power Co., which recently made application for permission for local operation. A distributing system will be installed. The company has a plant at Tuxedo, N. C., and furnishes service at Spartanburg and vicinity.

Lenoir, N. C.—Caldwell Power Co. is perfecting plans for the construction of a hydroelectric power plant on Wilsons creek, estimated to cost $50,000. Tucker & Laxton, Realty building, Charlotte, N. C., are engineers.

Pilot Mountain, N. C.—The Pilot Mountain Electric Co. is planning the construction of a power plant on the Ararat river.

McCormick, S. C.—The Common Council has granted a franchise to the Paul B. Wilson Electrical Machine Works, McCormick, to furnish service for local light and power.

Swansea, S. C.—The Common Council is planning the installation of a new street-lighting system, estimated to cost about $20,000. Bonds will be voted.

Savannah, Ga.—Savannah Electric & Power Co. has disposed of a bond issue of $1,750,000, the proceeds to be used for general operations, extensions, improvements, etc. A. A. Lawrence is president.

Miami, Fla.—The Hollywood Land & Water Co. has awarded a contract to the Southern Utilities Co. for the installation and operation of a lighting system at Hollywood-by-the-Sea.

NORTH CENTRAL STATES.

Bayard, O.—Bayard Electric Light Co. has been incorporated with a capital of $5000 by F. L. Summer, R. H. Morehead, John Schrader and others.

Lima, O.—Bids were received Oct. 14 for the installation of a street-lighting system of about 144 standards. Address Elmer McClain, director of public service.

Warsaw, Ind.—The council will install an ornamental post lighting system in the business district. Address the mayor.

Bloomington, Ill.—Bids will be received for poles and copper wire to construct a power line from the north side pumping station to the west side station. The estimated cost of the work is $2200. Address H. J. Wilson, city clerk.

Burlington, Ill.—Burlington Electric Co. has been organized with capital of $3000 to supply light for the village. A transmission line will be built from Hampshire, Ill., to Burlington and power will be purchased from the Northern Illinois Utilities Co. Address L. F. Kinef, Burlington, Ill.

Chicago, Ill.—The Englewood Commercial and Civic Association has agreed on the style of new illuminating scheme on 63d street, between Wentworth avenue and Wallace street.

Clinton, Ill.—Clinton Gas & Electric Co. is installing new cluster light posts in various parts of the city.

Decatur, Ill.—A petition for light at the intersection of East Clay and South Calhoun streets was referred to Commissioner Ruthrauff.

Vandalia, Ill.—The new $60,000 electric light and power plant has recently been placed in service. Service will be extended to the State Farm and Brownstown. The old flat rate of $1.25 has been abolished and several hundred new meters installed. Arrangements will be made to supply light and power to a number of surrounding towns and to rural districts.

Weldon, Ill.—The village will build a $15,000 electric light plant. Purchase has been made of a Diesel engine. The lines have been rehabilitated and 24-hr. service will be given.

Gillett, Wis.—Northern Wisconsin Power Co. has been incorporated with a capital of $75,000 by J. B. Read, A. L. Kreutzer and W. W. Smith.

Neenah, Wis.—An appropriation of $50,000 is being asked to light the Neenah channel. Address secretary of Civic Association.

Rhinelander, Wis.—Antigo Electric Light & Power Co.'s plant has been purchased by the stockholders of the Rhinelander Electric Light & Power Co., and the new owners will proceed with the erection of a new high-tension line from here to Antigo, connecting

the plant up with its water power plant south of the city.

Waukesha, Wis.—The Committee on Public Improvements will report its findings to the City Council relative to the placing of the electric light and telephone wires underground. Address the mayor.

Waupaca, Wis.—J. N. Cadby, Washington building, Madison, Wis., structural engineer, has prepared plans for an ornamental street-lighting system to be installed by the city of Waupaca. Address R. F. Whale, city clerk.

St. Paul, Minn.—Northern States Power Co., 208 South La Salle street, Chicago, has applied to the Federal Power Commission for a preliminary permit covering the following: Six projects located on the Mississippi river just above the mouth of Elk river at a point near the town of Monticello, and at a point near Clearwater, in Sherburne, Wright and Stearns counties, Minn.; on the St. Croix river at a point about 10 mi. above Center City, at a point just below the mouth of Snake river, and at a point about 3 mi. above and mouth of Kettle river, in Burnett and Polk counties, Wis., and in Pine and Chisago counties, Minn. The proposed use is for public utility purposes.

Kansas City, Mo.—Kansas City Light & Power Co., 14th street and Grand avenue, has leased a building at 1110 Baltimore avenue, for the establishment of a new substation. Equipment estimated to cost about $250,000 will be installed. The company is also planning the establishment of another substation on 14th street.

St. Louis, Mo.—Plans have been prepared by Architect H. G. Clymer for the erection of ice manufacturing plant and store house at the southwest corner of Devolsey street and Gravois avenue by the Polar Wave Ice & Fuel Co. The plant will be operated exclusively by electricity.

St. Louis, Mo.—Considerable electrical equipment will be installed in the ice, cold storage and packing plant to be erected by the Sieloff Packing Co., 4339 Natural Bridge avenue, on Sacramento street, estimated to cost $75,000.

Downs, Kan.—Downs Ice & Light Co.'s plant burned recently, with a loss of $80,000. The plant will be rebuilt.

Topeka, Kan.—The State of Kansas, Engineering Department, is completing plans for the erection of a 2-story addition to the electrical laboratory at the state university, Lawrence, Kan., to cost about $40,000.

Madison, Neb.—Plans are being prepared by Henningson Co., engineer, National Bank building, Omaha, Neb., for additions to the electric light plant to cost $70,000.

Nebraska City, Neb.—A transmission line will be built from Nebraska City to Dunbar to supply the latter place with power and lights. Address the mayor.

Dunn Center, N. D.—The village contemplates installing electric light service. Address village clerk.

New Rockford, N. D.—A high line will be constructed from here to Carrington in the spring. Address C. Brazil, manager, New Rockford.

SOUTH CENTRAL STATES.

Bowling Green, Ky.—The Lost River Cave Co., recently organized, is planning the construction of a hydroelectric power plant for local light and power service. Henry L. Underwood is president.

Covington, Ky.—Considerable electrical equipment will be installed in the plant addition to be erected by the Michaels Art Bronze Co., estimated to cost $40,000.

Owensboro, Ky.—The Board of City Commissioners is planning the installation of new electric equipment at the municipal pumping station used for the city waterworks. The daily capacity will be increased from 3,000,000 to 4,000,000 gals.

Aliceville, Ala.—A loss of $2500 was sustained by the Aliceville Electric Co. recently, when the power plant was damaged by fire.

Ardmore, Okla.—The State Board of Control, Oklahoma City, is arranging for the immediate construction of a power house at the local Confederate Home. George F. Clark is chairman.

Crescent, Okla. — The Common Council is completing plans for the construction of its proposed transmission line to Guthrie, Okla., for power supply for commercial service at Crescent. W. B. Rollins & Co., Railway Exchange building, Kansas City, Mo., are engineers.

Dallas, Tex. — The Chamber of Commerce, Corsicanna, Tex., is negotiating with the Texas Electric Co., for an extension of its electric interurban system to Mexia.

Memphis, Tex. — The Common Council has arranged for a bond issue of $65,000, for the installation of a municipal electric plant.

WESTERN STATES.

Albuquerque, N. M.—Rio Grande Light, Heat & Power Co. has applied to the Federal Power Commission for a license covering the following project: Dam and power house in the Rio Grande river in Rock canyon, in Sandoval and Santa Fe counties, N. M., for public utility purposes.

Buena Vista, Colo.—Gladstone Mining Co. has applied to the Federal Power Commission for a license covering a power development project on Denny Creek, Colo., for mining purposes.

Boise, Ida.—Mountain States Telephone & Telegraph Co. will extend and improve its lines in the south portion of the state, the estimated cost of the work being $400,000.

Independence, Cal.—Darwin Silver Co., care W. A. Lamer, has applied to the Federal Power Commission for a license covering the following project: Transmission line from junction of transmission lines of Division Creek and Cottonwood Creek power plants of the city of Los Angeles to mining properity of applicant in Inyo county. The proposed use is for mining purposes.

PROPOSALS.

Washington, D. C.—Sealed proposals will be opened in the office of the Treasury Department, supervising architect's department, Oct. 17, for extension to the fire-protection system at the U. S. Public Health Service Hospital No. 2 (Broadview), Chicago. Drawings and specifications may be obtained from the superintendent of construction at that building, or at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

Chicago, Ill.—Bids will be received Oct. 17 for the furnishing of No. 19 B. & S. gage paper-insulated, lead-covered fire-alarm cable; 20,000 ft. of 5-pair and 20,000 ft of 10-pair. Address William G. Keith, commissioner of gas and electricity, room 614, City Hall, Chicago.

Washington, D. C.—A. L. Flint, general purchasing officer, Panama Canal, will receive bids up to 10:30 a. m., Oct. 18, for electrical equipment for canal zone service, including receptacles, reflectors, wires, cables, aero lighting switches, etc., all as set forth in Circular 1459.

Washington, D. C.—The District Commissioners, Room 509, District building, will receive bids until 2 p. m., Oct. 26, for electrical work, heating and ventilating, etc., in the new High School building No. 176. Cuno H. Rudolph, Charles W. Kutz, and James F. Oyster are commissioners.

INCORPORATIONS.

Wilkinsburg, Pa.—Standard Electric & Radio Corp. Capital, $5000. To manufacture electrical equipment. T. K. Lewis, Wilkinsburg, treasurer.

Fly, O.—Trail Run Telephone Co. Capital $6000. Incorporators: C. H. Busche and others.

Chicago, Ill.—Automotive Electric Sales Co., 2637 South Michigan avenue. Capital, $50,000. To manufacture and deal in electrical devices, accessories and apparatus. Incorporators: Abe Siegal, Philip Siegal and Benjamin Siegal.

Chicago, Ill.—Franklin Light Co., 127 North Dearborn street. Capital, $10,000. To manufacture and deal in electrical fixtures, supplies, etc. Incorporators: Harvey Adams, Benjamin J. Kanue and G. Litka. Correspondent, Weil & Chaikin, room 1208, 137 North Dearborn street, Chicago.

Haverhill, Mass.—John D. Osgood, Inc. Capital, $35,000. To manufacture electric heating appliances. John D. Osgood, 10 Falmouth street, is president and treasurer.

Springfield, Mass.—Radio Development Co. Capital, $25,000. To manufacture radio equipment. Frank W. Sickles is president, and A. Roul Silber, treasurer, both of Springfield.

New York, N. Y.—Standard Railway Fuse Corp. Capital, $50,000. To manufacture electrical equipment. Incorporators: E. D. Purcell, G. E. McClure and P. H. Miller. The company is represented by Newmark & Miller, 154 Nassau street.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks.

Bond Offering of Central Illinois Light Co.

The Federal Securities Corp. and Ames, Emerich & Co., Chicago, are offering $1,053,000 Central Illinois Light Co. first and refunding mortgage gold bonds paying 7.5%, dated April 1, 1913, due April 1, 1943, at a price of 98.5 and interest to yield over 7.65%. The Central Illinois Light Co. supplies electricity for light and power, together with gas and steam heat, without competition to the cities of Peoria and Pekin, Ill. The adjacent towns of Averyville, Farmington, Cuba, Eureka, East Peoria, Washington, Elmwood and Roanoke, together with intervening territory, are also supplied with light and power from the Peoria Central station. The population served by the company is estimated to be in excess of 115,000.

The proceeds from the sales of these bonds will be used to reimburse the company for expenditures made in the installation of a new 16,000-hp. turbine, together with condenser, pumps and other necessary extensions and improvements recently installed to care for rapidly increasing business. The net earnings of the property for the 12 mo. previous to Sept. 1, 1921, after taxes equaled $953,383.38, or 2.24 times the annual interest charges of $424,475 on the total funded debt, including these bonds.

Illinois Utility to Issue Gold Bonds.

The Central Illinois Public Service Co., Mattoon, Ill., has petitioned the Illinois Public Utilities Commission for the right to issue $450,000 first and refunding gold mortgage bonds to be sold at 75% of their par value and accrued interest. The company also seeks the right to issue $142,000 general mortgage gold bonds.

United Gas & Electric Co.'s Subsidiary.

	1921.	1920.
August gross	$ 952,282	$ 962,314
Net after taxes	333,090	269,995
Total income	353,510	290,593
Surplus after charges	139,753	102,464
12 mo. gross	12,502,395	11,563,165
Net after taxes	3,872,735	3,760,472
Total income	4,149,059	4,032,027
Surplus after charges	1,522,452	1,558,175

American Power & Light Co. Subsidiaries.

	1921.	1920.
July gross	$1,846,883	$1,640,003
Net after taxes	657,922	459,006
12 mo. gross	24,476,558	18,913,917
Net after taxes	8,200,787	6,998,222

Nebraska Power Co.

	1921.	1920.
July gross	$ 231,171	$ 221,549
Net after taxes	67,657	58,963
Total income	69,231	61,237
Surplus after charges	20,990	26,959
12 mo. gross	3,054,472	2,703,330
Net after taxes	898,544	910,704
Total income	979,079	981,918
Surplus after charges	495,553	595,851
Balance after preferred dividends	285,553	385,851

Alabama Power Co. and Subsidiaries.

	1921.	1920.
August gross	$ 361,855	$ 349,417
Net after taxes	187,189	160,695
12 mo. gross	4,503,576	3,768,540
Net after taxes	2,282,985	1,982,750

Idaho Power Co.

	1921.	1920.
August gross	$ 219,555	$ 231,509
Net after taxes	125,878	129,559
Total income	137,002	138,728
Surplus after taxes	79,717	89,559
12 mo. gross	2,292,040	2,157,713
Net after taxes	1,133,977	1,114,869
Total income	1,305,284	1,201,789
Surplus after charges	654,551	716,964
Balance after preferred dividends	566,181	638,711

New Issue of Savannah Electric & Power Co. Bonds Sold.

A new issue of $1,750,000 Savannah Electric & Power Co. first and refunding mortgage 7.5% gold bonds, series "A," dated Oct. 1, 1921, due Oct. 1, 1941, not callable for 10 yrs., recently offered by Lee, Higginson & Co. and Stone & Webster, Inc., has been sold.

The company will purchase, under the plan of reorganization, all properties and franchises owned by the Savannah Electric Co. and its subsidiaries, comprising the greater part of the electric light and power business and the entire electric railway business in the city of Savannah, Ga., and its suburbs. The population served is about 90,000. The net earnings of the company for the 12 mo. ending Sept. 30, 1921, are about 2.5 times the interest charges on all bonds, including this issue.

Standard Gas & Electric Co. Subsidiaries.

The combined earnings of Standard Gas & Electric Co.'s public utility subsidiaries for the 12 mo. ended Aug. 31, 1921, compare with the earnings of the corresponding previous year as follows:

	1921.	1920.
12 mo. ended Aug. 31:		
Gross revenue	$34,734,254	$30,297,819
Gross earnings*	33,359,697	28,858,907
Net earnings	11,743,041	10,907,873

*Does not include revenue collected from other producing companies.

Consumers Power Co. and Michigan Light Co.

	1921.	1920.
August gross	$1,068,107	$1,168,063
Net after taxes	378,771	277,855
Surplus after fixed charges	178,080	87,429
Balance after preferred dividends	107,216	22,847
8 mo. gross	9,265,107	9,102,418
Net after taxes	3,627,586	2,648,205
Surplus after fixed charges	2,094,641	1,287,427
Balance after preferred dividends	1,539,955	771,248

Commonwealth Power, Railway & Light Co. and Subsidiaries.

	1921.	1920.
August gross	$2,372,209	$2,627,694
Net after taxes	723,249	643,410
Surplus after fixed charges	97,938	43,269
Balance after preferred dividends	8,173	*46,495
8 mo. gross	20,593,588	20,178,684
Net after taxes	6,698,881	5,777,032
Surplus after fixed charges	1,716,784	1,156,609

*Deficit.

Philadelphia Co. and Subsidiaries.

	1921.	1920.
August gross	$ 434,284	$ 902,134
Deficit after taxes	39,279	*246,030
8 mo. gross	7,053,093	10,043,873
Net after taxes	1,983,988	3,828,312

*Surplus.

North American Co.

For the 12 mo. ended Aug. 31 last, surplus after all charges was $6,024,108, compared with $5,229,448 in the previous 12 mo., an increase of over 15%.

Great Western Power System.

	1921.	1920.
August gross	$ 602,930	$ 596,096
Net after taxes	392,337	318,020
Surplus after charges	145,083	120,121
8 mo. gross	4,811,896	3,969,322
Net after taxes	3,101,366	2,155,754
Surplus after charges	1,188,993	568,408

Dividends.

	Term.	Rate.	Payable.
Am. Lt. & Tr., pfd	Q	1.5%	Nov. 1
Am. Lt. & Tr., com	Q	1%	Nov. 1
Carolina Pr. & Lt	Q	1.5%	Nov. 1
Commonwealth Edison	Q	2%	Nov. 1
Crocker-Wheeler, com	Q	1%	Oct. 15
Crocker-Wheeler, pfd	Q	1.75%	Oct. 15
Edison El. Ill. of Boston	Q	$3	Nov. 1
Elec. Utilities, pfd	Q	1.25%	Oct. 15
Kaministiquia Pr.	Q	2%	Nov. 15
Mil. El. Ry. & Lt., pfd	Q	1.5%	Oct. 31

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 3.	Bid Oct. 10.
Adirondack Electric Power of Glenns Falls, common	6	11	12
Adirondack Electric Power of Glenns Falls, preferred	6	72	78
American Gas & Electric of New York, common	..	101	102
American Gas & Electric of New York, preferred	6	38½	40
American Light & Traction of New York, common	..	89½	89
American Light & Traction of New York, preferred	6	79	79
American Power & Light of New York, common	4	57	62
American Power & Light of New York, preferred	6	66	72
American Public Utilities of Grand Rapids, common	..	9	8
American Public Utilities of Grand Rapids, preferred	..	17	17
American Telephone & Telegraph of New York	9	108½	108
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	11	12
American Water Works & Elec. of New York, 1st preferred	..	51	52
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	37	38
Cities Service of New York, common	+extra	122	144
Cities Service of New York, preferred	6	46	54
Commonwealth Edison of Chicago	8	109	109½
Comm. Power, Railway & Light of Jackson, common	..	8	8
Comm. Power, Railway & Light of Jackson, preferred	6	25	26
Federal Light & Traction of New York, common	..	8	8
Federal Light & Traction of New York, preferred	..	53	56
Northern States Power of Chicago, common	..	44	46
Northern States Power of Chicago, preferred	ex.div.7	79	79
Pacific Gas & Electric of San Francisco, common	..	57½	58
Public Service of Northern Illinois, Chicago, common	7	79	79
Public Service of Northern Illinois, Chicago, preferred	6	80	80
Standard Gas & Electric of Chicago, common	..	7¾	8
Standard Gas & Electric of Chicago, preferred	8	33¼	33½
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	4½	5
Western Power of San Francisco, common	..	26	29
Western Union Telegraph of New York	..	83	84¼
Industrials—			
General Electric of Schenectady	8	125½	125
Westinghouse Electric & Mfg. of Pittsburgh, common	7	46	44½